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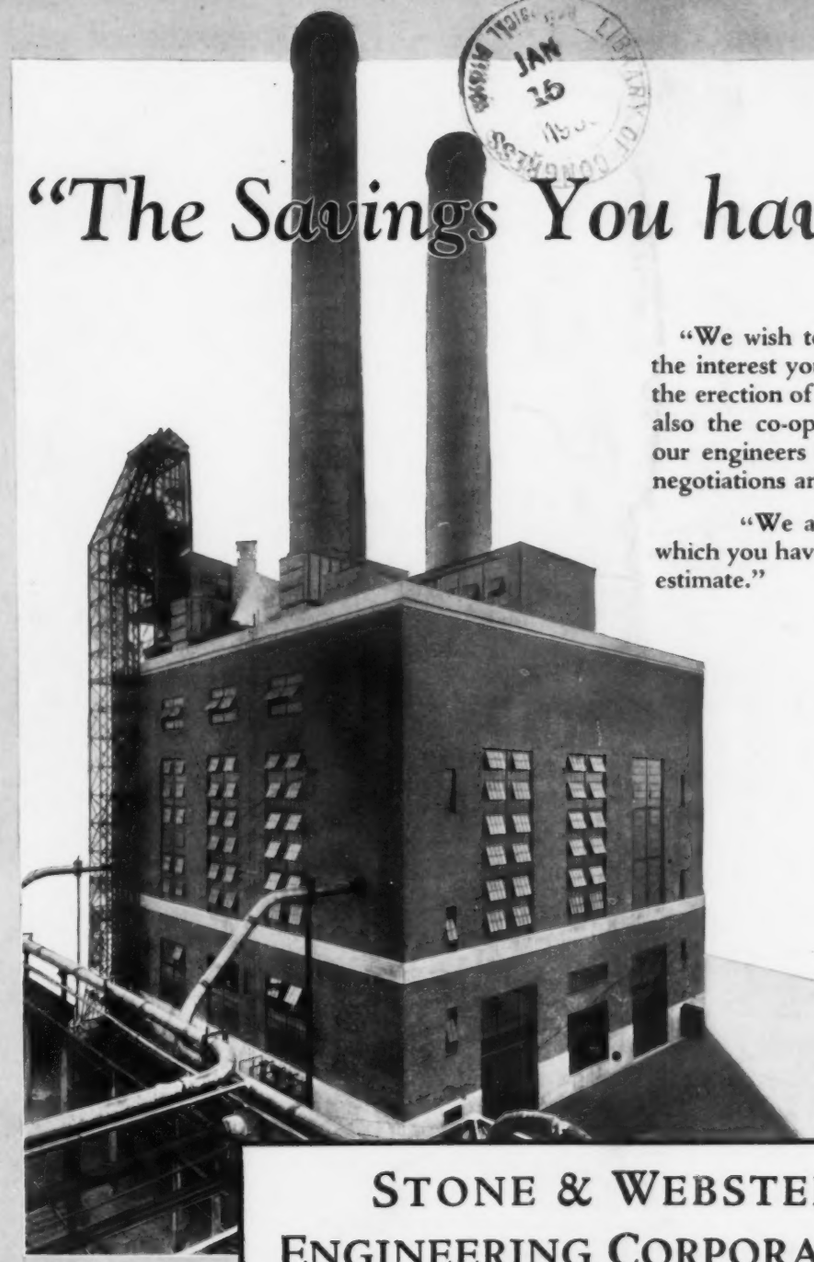
"We also appreciate the savings which you have shown over your original estimate."

Extracts from letter from Vacuum Oil Company to Stone & Webster, Inc.



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ENGINEERING CORPORATION

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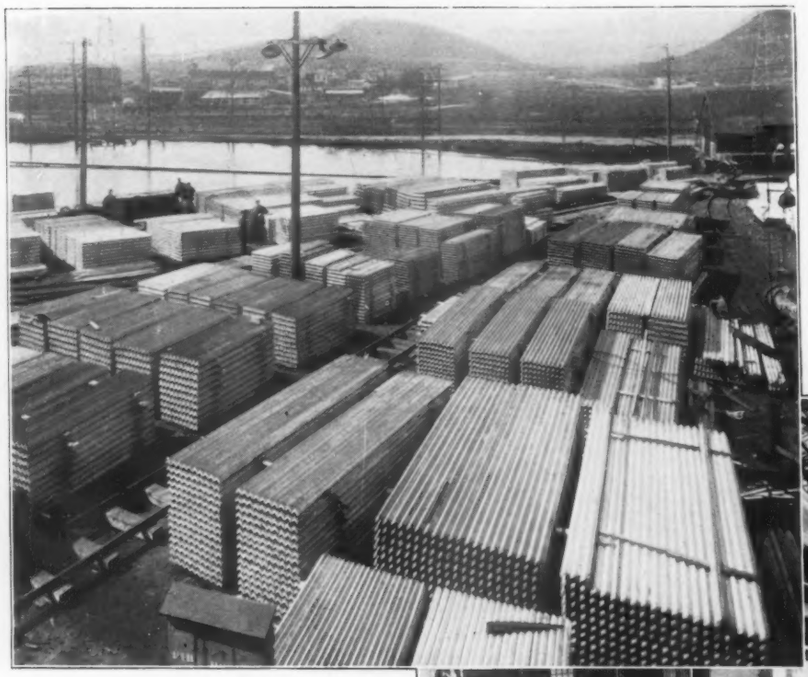

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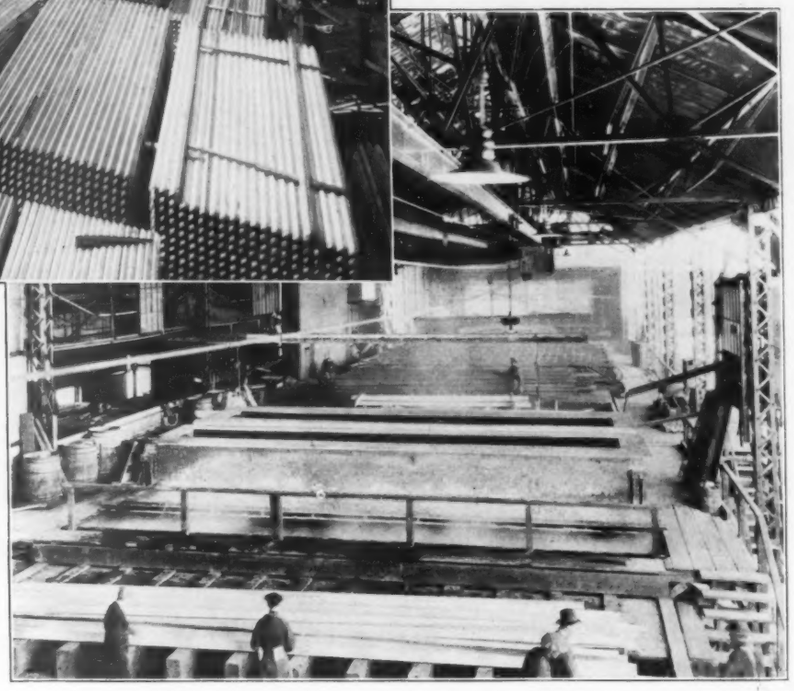

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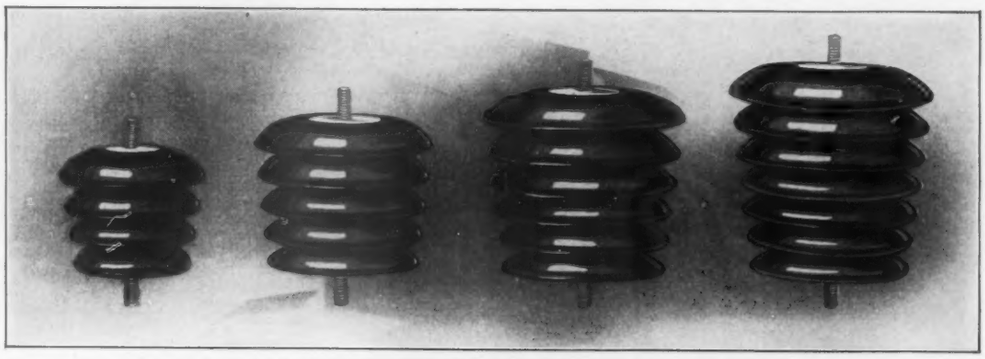

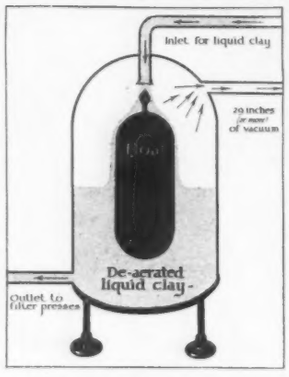

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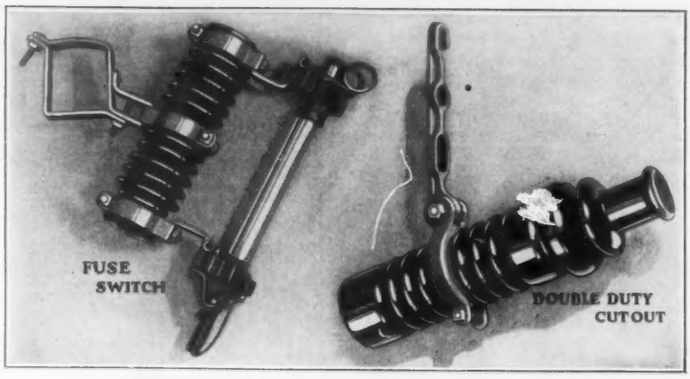

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BETTER SERVICE

Through Supervisory Control

By L. A. BUESE[1] and P. B. GARRETT[2]

PICTURE a substation operator having at his finger tips the full control and supervision not only of the apparatus in his own station, but also that of as many as three other substations several miles away in as many different directions. Further, visualize a system which provides continuous indication of feeder regulator position, transmits several varieties of meter readings and controls the door locks of the remote stations, in addition to having full control of their switching equipment—and all of this over four conductors of a small telephone cable. Such is the supervisory control system now being applied to several groups of distributing substations by the Los Angeles Gas & Electric Corporation, serving the Los Angeles metropolitan area.

Supervisory control is utilized by this corporation to reduce operating costs of substations in districts where the load is insufficient to warrant the presence of a full-time operator. Substations are classified in three groups—heavy load, medium load and light load—according to the load density of the districts which they serve. It is the principle aim of this article to deal with the light-load class of substations and the operating problems related to them.

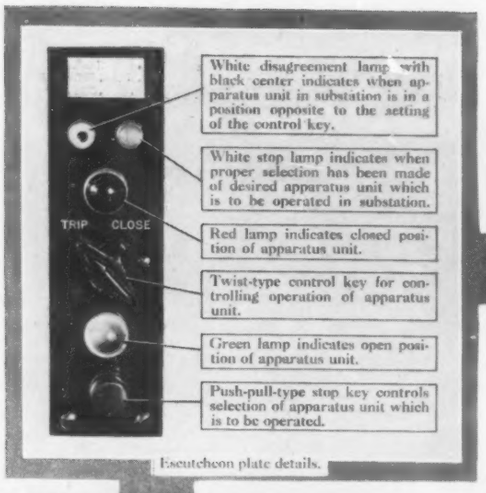
ECONOMICS sets the limits; good engineering finds the ways and means. The Los Angeles Gas & Electric Corporation has met the economic operating problems involved in expanding its electric distribution system by concentrating in a few substations the control and operating responsibility for groups of other stations. Operating costs thus are reduced and service to the consumer is appreciably improved.

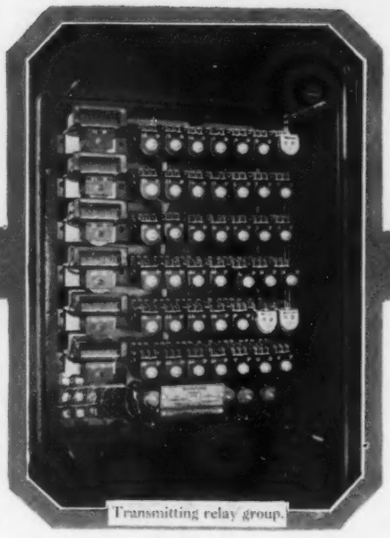
Prior to the advent of supervisory control systems this class of substations represented a serious economic problem since, to render fully adequate and reliable service and to care for switching operations, meter readings and general supervision, it was necessary to maintain full-time supervision. Such operating conditions naturally resulted in inefficient utilization of an operator's time and consequent higher cost of station operation.

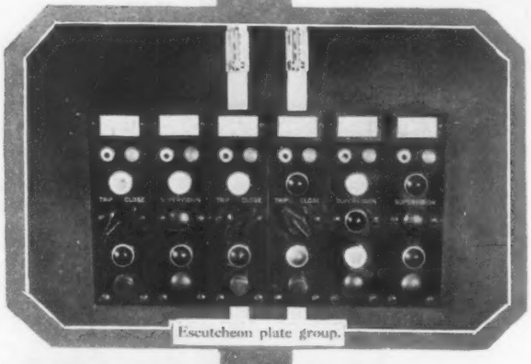
Substations in medium-load districts have operators on duty in the station from 8 a.m. to 10 p.m., leaving the station from 10 p.m. until 8 a.m. in charge of a resident operator living in a house on the substation property. Even in this class of station the operator's time cannot be utilized most efficiently until the installation of a supervisory system brings under his control an outlying group of light-load stations. With this centralization of control, effective 24-hour supervised service is given by all substations without excessive operating cost and also without overburdening the operating force of the controlling stations. As mentioned before, dependable supervisory control

[1] Protection engineer, Los Angeles Gas and Electric Corporation, Los Angeles.

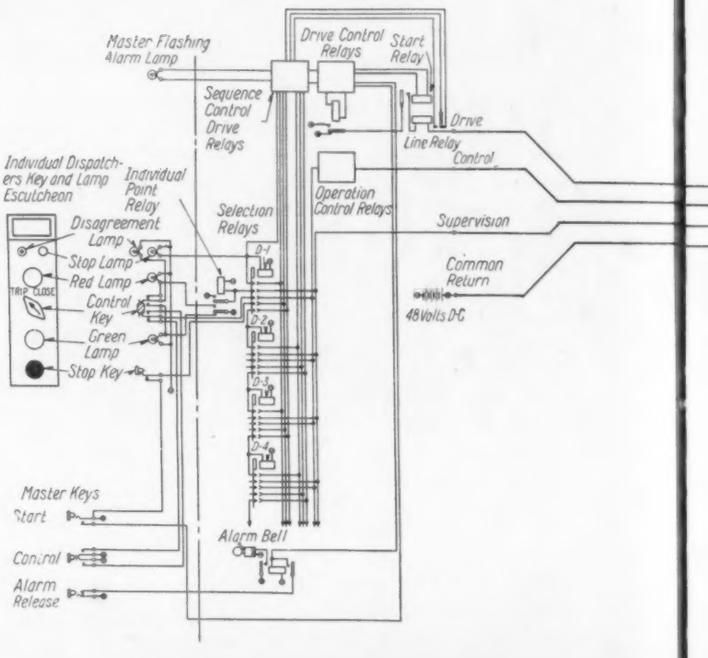
[2] Engineering supervisor, Westinghouse Electric & Manufacturing Company, San Francisco.

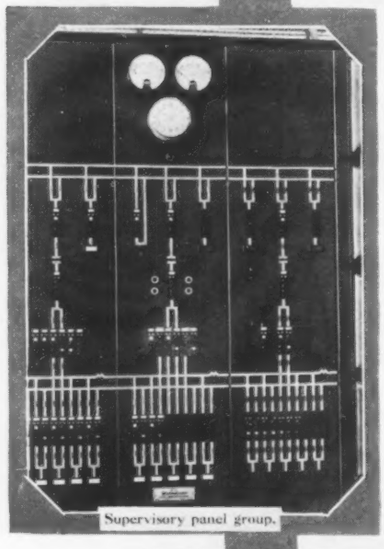

TRIP
CLOSE
White disagreement lamp with black center indicates when apparatus unit in substation is in a position opposite to the setting of the control key.
White stop lamp indicates when proper selection has been made of desired apparatus unit which is to be operated in substation.
Red lamp indicates closed position of apparatus unit.
Twist-type control key for controlling operation of apparatus unit.
Green lamp indicates open position of apparatus unit.
Push-pull-type stop key controls selection of apparatus unit which is to be operated.
Escutcheon plate details.

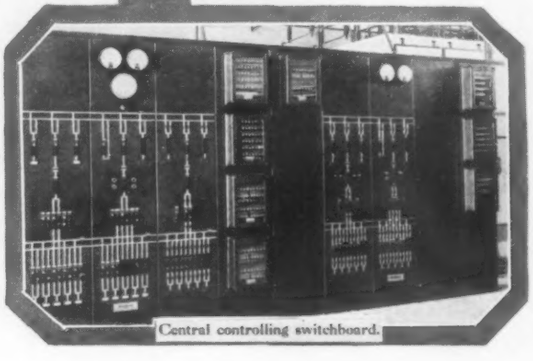

Transmitting relay group.

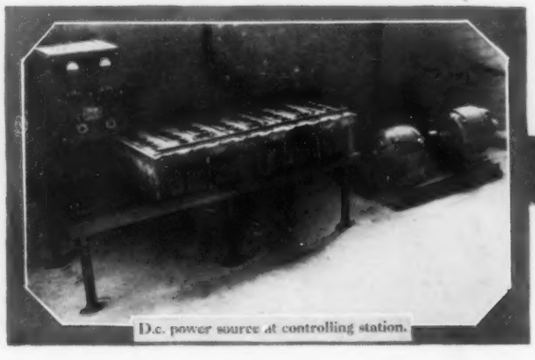

Escutcheon plate group.

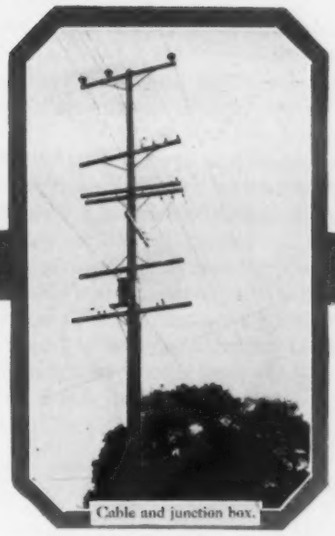
Schematic pictograph of synchronous-visual
which distant equipment is brought under



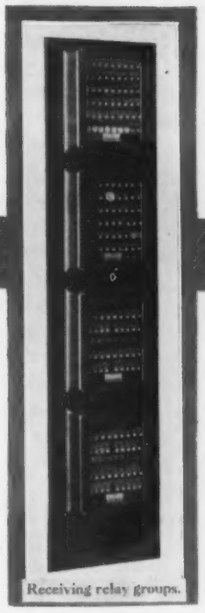

Supervisory panel group.


Central controlling switchboard.

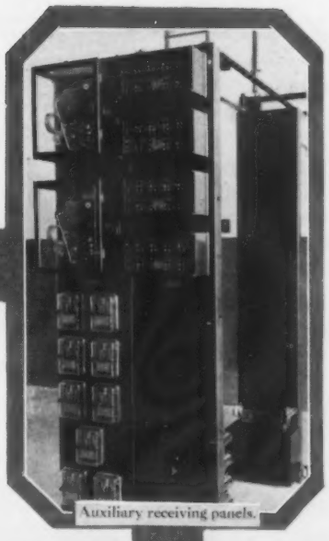

D.c. power source at controlling station.



Cable and junction box.

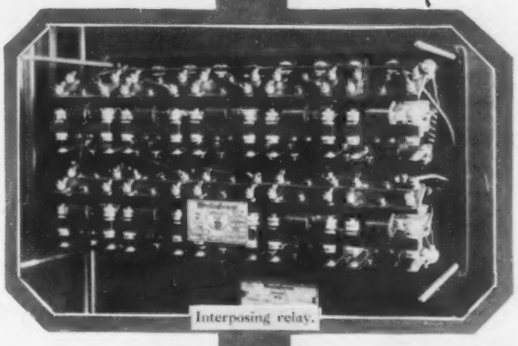


Receiving relay groups.

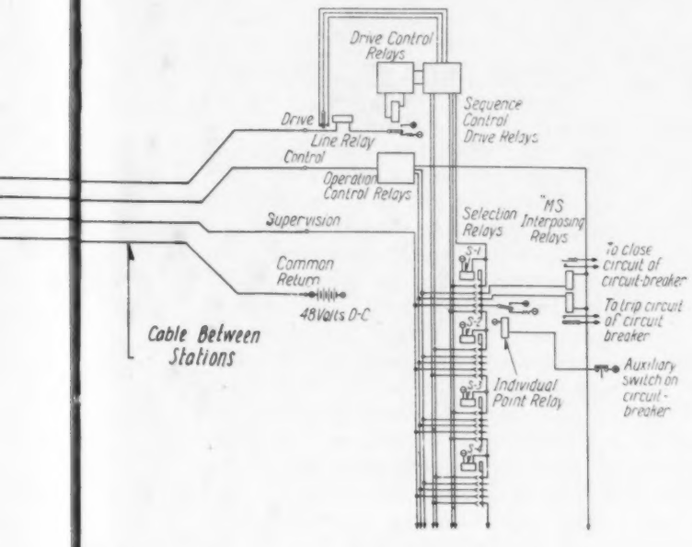


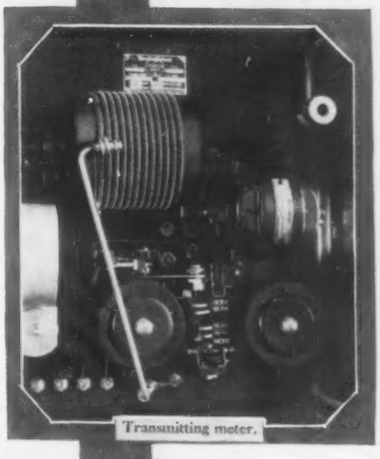
Auxiliary receiving panels.

system of supervisory control through direct control of a central operator.

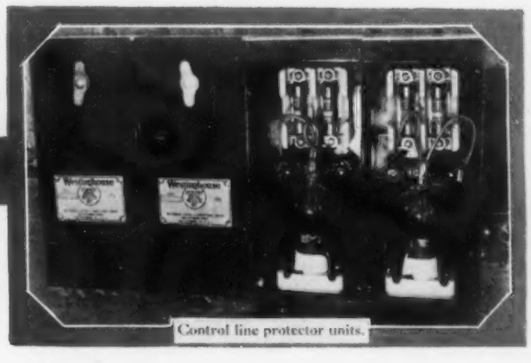


Interposing relay.

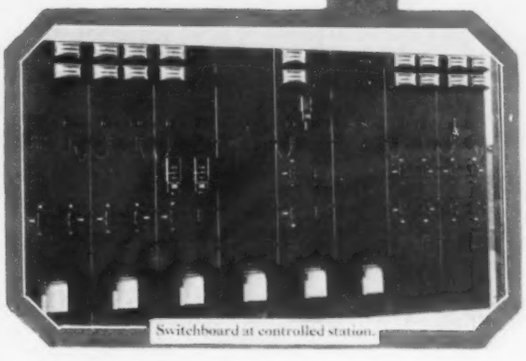




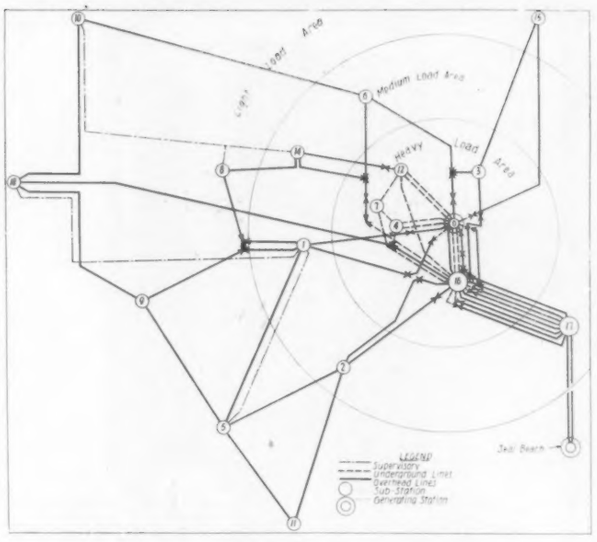
Transmitting meter.



Control line protector units.



Switchboard at controlled station.



Schematic diagram of all-relay supervisory systems of the Los Angeles Gas & Electric Corporation

equipment has made this operating set-up possible, and in the application of this equipment to purely commercial electric distributing stations the Los Angeles Gas & Electric Corporation has pioneered the field here on the Pacific Coast. Previous supervisory control applications have involved only railway substations or have been limited to the control of certain specific circuits.

The initial supervisory control installation was made on the company's system in 1927 when its No. 1 substation was made a controlling or dispatching center for the new $275,000 No. 18 substation 6.5 miles away. During the past year No. 5 substation, 4.5 miles away, has been brought under the control of this same station. During this same period No. 14 substation has been made the control center for No. 10 substation, 6.5 miles distant, and No. 8 substation, 2 miles away. This grouping plan is to be extended as new substations are built and as the distributing system is expanded.

Typical of the company's present practice is the equipment application at No. 10 substation. There, two 16.5-kv. high-tension lines, one 3,000- and one 5,000-kva. transformer bank, eight 4-kv. distribution feeders and all related metering and control equipment is subject to the will of the central operator six miles away. The design of this station includes a full double bus for both high- and low-tension service with a full complement of oil circuit breakers and disconnecting switches. Each distribution feeder may be fed direct from the auxiliary bus or through its voltage regulator from the main bus, this flexibility having obvious advantages. Wherever circuit and transformer conditions are such that the short-circuit load on any given feeder might exceed about 10,000 amp., the feeders are equipped with 300-amp., 3-per-cent reactors to limit short-circuit currents to a maximum of about 6,500 amp.

Each circuit group of oil filled apparatus is totally enclosed in concrete cells fitted with transite doors and equipped overhead with automatic sprinkler heads which, in case of fire, release carbon tetrachloride from two centrally located 20-gal. tanks maintained at 100 lb. pressure. This permanently installed fire-fighting layout is designed to give adequate protection to service and equipment, even though there is no operator on the property. The isolation of oil-filled apparatus together with vents for explosive gases and drains for spilled oil have been carefully planned and laid out.

The main station switchboard is typical of any electrically operated substation and, of course, the equipment within the station may be controlled directly from its own board as well as from the distant dispatching center. A recording kva. meter serves each transformer bank. A recording kva. meter together with three recording ammeters and three recording voltmeters is mounted on the board and arranged with the necessary transfer jacks so that any one of these meters may be connected to any distribution feeder for checking purposes.

The supervisory control equipment provides for the following operating functions:

1. Operate any oil circuit breaker in the controlled station.
2. Give a signal alarm to the controlling station whenever any oil circuit breaker changes position.
3. Give a visual indication on the controlling switchboard of the open or closed position of every oil circuit breaker in the controlled station.
4. Operate solenoids for releasing the locks on both front and rear doors of the controlled substation.
5. Give a signal to the controlling station upon the opening or closing of any outside door at the controlled station.
6. Give an alarm to the controlling station whenever the 4-kv. bus loses its potential or the d.c. bus serving the trip circuits of the overload relays loses its potential.
7. Give an alarm to the controlling station whenever the pressure in the fire extinguisher tanks drops below a predetermined value.
8. Give an indication to the controlling station whenever any induction voltage regulator goes to maximum buck or boost position. This is a "group" indication; the control operator then may monitor each circuit with his supervisory voltmeter to determine which circuit or circuits are affected.
9. Transmit to the controlling station switchboard the load readings on each transfer bank secondary, and the voltage on each of the 4-kv. buses.

With regard to the door control mentioned in Item 4, any authorized person approaching a supervised substation will have a standard key which will admit such person to the telephone booth at the rear of the station. Then a call to the dispatcher will result in a message to the operator controlling that particular substation and that operator will operate one or both door openers, according to the request. This system introduces no great inconvenience and does serve to check very definitely just who may be in any of the remotely controlled stations. In addition to the foregoing, the regulated voltage of each distribution feeder may be read at the remote control point by the operator clearing the auxiliary 4-kv. bus from the transformer secondary and closing one distribution feeder at a time to this auxiliary bus, in which case the bus voltage reading will be the circuit voltage reading.

Supervisory control equipment at each of the substations under control consists of four 16 x 90-in. "stretcher-leveled" steel panels, two of which carry the groups of telephone-type supervisory relays. The interposing relays are carried on the third panel and on the fourth panel is a transmitting ammeter and a transmitting voltmeter together with the necessary auxiliary relays through which any voltage or current reading may be sent over the interconnecting cable to the controlling station meters. These transmitting meters operate on the Kelvin balance principle and transmit d.c. milliamperes in proportion to the a.c. voltage or amperage impressed upon them. In the control station at the receiving end this small current energizes d.c. milliammeters carrying specially calibrated scales which give readings directly proportional to the alternating current or potential involved at the transmitting end.

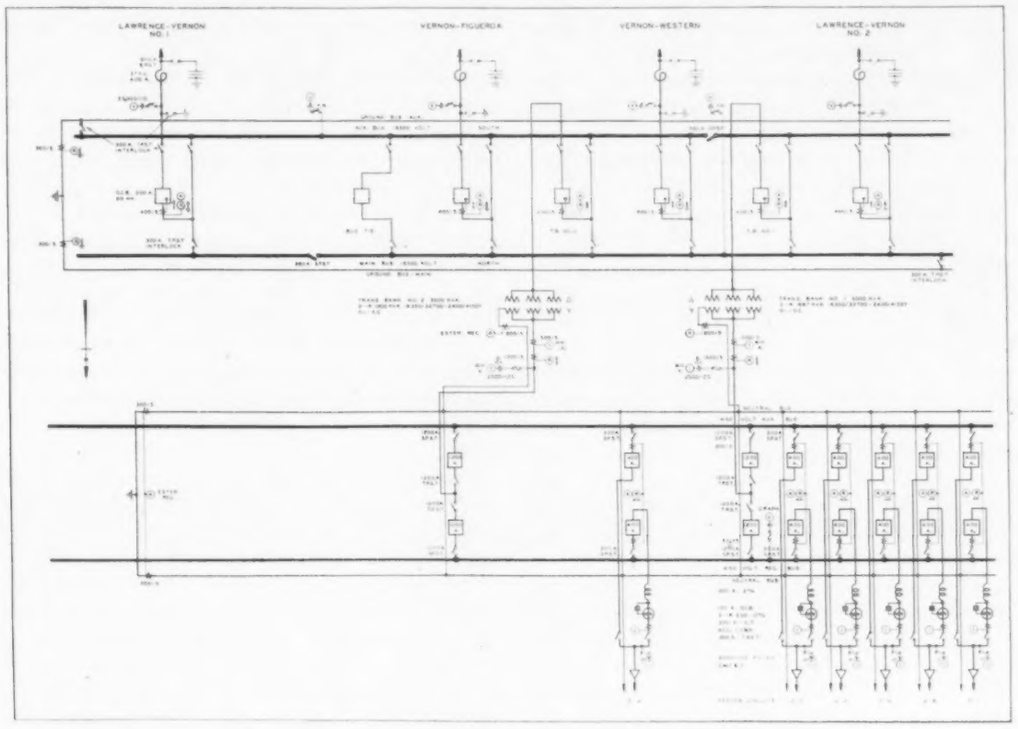
With this arrangement the resistance of the circuit between stations has no effect upon readings.

The interposing relays mentioned early in the preceding paragraph are controlled by the sensitive telephone-type relays and in turn control the relatively heavy operating current for their respective pieces of equipment. This operating current is supplied by a local battery. Control wires for operating an oil circuit breaker through the supervisory system are connected from the interposing relay panels to the main station switchboard where they are paralleled with the usual manual control circuit wires at their respective equipment panels. Supervisory circuits for determining the operating position of oil circuit breakers or other apparatus are connected from the supervisory relay panel directly to the pallet switches of the apparatus in question.

Direct-current energy for the operation of the supervisory equipment is supplied by a 1-kw. motor-generator set at the central controlling station of each group. This M-G set serves nothing else and is backed up by the station control storage battery which automatically is cut in for emergency service in case of failure of the M-G set. Since a service interruption momentarily paralyzes the supervisory equipment, an automatic relay is provided which promptly resets that equipment, sets in operation the monitoring equipment which methodically checks every supervised position, and calls the attention of the operator to the change-over through an alarm signal. Protection against grounds on the d.c. circuits of the supervisory system is afforded by a sensitive d.c. ground detector of the design described by T. J. Lovell in ELECTRICAL WEST (Aug. 1, 1928, p. 82). Direct-current service at the controlled stations is taken from a 54-volt tap on the 125-volt station battery.

Every supervised position in each substation controlled from a central control station is automatically monitored every half-hour. A Telechron clock on the switchboard at the controlling station controls this feature through a set of contacts. The purpose of this "clock check" is to give a periodic indication of the condition of the line wires between stations and also to assure the dispatcher that the entire supervisory equipment is in operating condition. It is not intended as a check of the indicating lamps, although the clock check inherently performs this function. A typical operating condition for one particular substation includes within a year's time about 17,000 "clock checks," 10,000 meter readings, and about 2,400 other normal control operations instigated either by the controlling operator or by automatic relays at the controlled stations. A change in position of any apparatus in the substation, not originated by the controlling operator, is indicated to him immediately. The disagreement lamp on his board shows which piece of equipment has operated and an audible alarm calls this to his attention.

At the controlling station the supervisory equipment for each substation under control is mounted on a group of five steel panels similar to those already described. Three of these panels carry a dummy bus and equipment layout together with the necessary control keys and signal lamps. This diagrammatic layout gives the operator an exact indication of both the physical and electrical position of the equipment involved, showing a red light for a closed breaker and a green light for an open breaker. For apparatus under supervision only,



Single-line diagram of Substation No. 2 of the Los Angeles Gas and Electric Corporation, typical of those controlled by supervisory equipment

such as the fire extinguisher and the regulators and buses. there are suitably identified visual markers carrying red and green lamps to indicate whether or not the apparatus represented is functioning properly. An ammeter is provided for reading the load on the transformer bank and a voltmeter for reading the voltage on the 4-kv. buses. A small supervisory switch permits these meters to be connected to any desired phase.

The other two panels of the group accommodate the small supervisory relays similar to those at the substation under control. These relays connect the control key on the control board (which key represents a given circuit breaker) to the corresponding interposing relay and through that relay over the supervisory circuits to the correct relay at the station under control. With this circuit thus set up, operating impulses from the control key position in question will operate the breaker in the remote station in exactly the same manner as if it were only in the next room.

Between stations the 11-pair No. 19 gage solid-copper, double paper-wrapped, lead-covered control cable is carried on the regular distribution or transmission poles. Only two of the eleven pairs of wires are used for supervisory control, the others serving for telephone communication and other special purposes. To facilitate the isolation of cable trouble, 11-pair cable junction boxes are placed at each station and 26-pair junction boxes are inserted in the line approximately every 4,000 ft. Protection is provided against damaging currents which might be imposed upon the cable and its circuits under system trouble conditions. The cable at each station is connected to the related supervisory equipment through 4-kv., 3-amp. porcelain fusible disconnecting links of the type commonly used in the primary of distribution transformers. In addition to this, the leads to the equipment are connected to four protector bulbs or tubes especially designed for this purpose. These tubes are charged at a low pressure with an inert gas which has the property of becoming ionized easily, thus providing a current-carrying path to ground. They are designed to break down at from 250 to 450 volts a.c. (effective value), thus providing a discharge path capable of carrying 50 amperes for two seconds. The discharge characteristics are not changed by many such successive discharges.

Each supervisory substation has regulated central-exchange telephone service, private-line telephone service and special communication service for testing purposes. The regular exchange service is provided by the telephone company and consists of a telephone mounted in a small booth at the rear of the substation building with an extension telephone at the station switchboard. For dispatching service there is a leased pair of wires direct from each substation to the central dispatcher's communicating board. This serves to give the dispatcher at all times an open communication channel direct to each substation. In addition to this, and provided solely for expediency and convenience in checking and testing the supervisory equipment, a pair of conductors in the supervisory control cable between each supervised station and its controlling station is reserved as a communication channel. Jacks on the panels at both controlling and controlled stations make possible close checking and co-operation between the test man at the remote station and the control-station operator through constant communication as the test is conducted point by point. A head-set used by the test man leaves both his hands free for his work.

Adequate and satisfactory maintenance of the station under supervisory control is accomplished by one man and a helper, each devoting one half-day per week to each station. These men are required to inspect thoroughly all working parts, to wind recording meters and renew charts, to check station battery voltages and keep the station generally in a clean condition and in working order. Once each week each supervised position is tested for correct indication and each metering position is checked for correct reading and the continuity of each control circuit is checked as far as the interposing relays. Equipment that is in service at the time of the check test is not operated, as this would result in otherwise unnecessary service interruptions. However, all oil circuit breakers and other controlled equipment that may be operated without interference to normal station service are given an actual operating test which includes everything from the control key in the controlling station to the actual operation of the controlled equipment.

While discussing routine tests, it is appropriate to mention specifically the fact that by far the best operating service has been obtained from the telephone-type relays, which are the heart of this equipment, by leaving them strictly alone unless they actually develop definite trouble. When they do infrequently develop operating trouble, these relays are repaired only by qualified men, a step that has proved itself well worth while.

No special effort in training operators for the controlling station, other than something of a day-by-day course of instruction as the equipment was installed and tested, was found to be necessary. Operators capable of handling the medium-load class of distributing station were found to be fully capable of discharging the added duties and responsibilities incident to the installation of the added switchboard panels controlling the remote stations.

For a year prior to the initial supervisory control installation a detailed study was made of the supervisory equipment and all related circuits until the system was thoroughly understood in its most minute detail. The time and effort spent in this study has proved itself to be a most worth-while investment from an installation, operating and service angle. The resulting intimate familiarity with both equipment and circuits facilitated the installation of the equipment without the slightest irregularity. This knowledge served also as a most efficient basis for effective instruction of operating and maintenance men and has contributed materially toward the satisfactory operation of the system.

In the matter of maintenance men, the intimate understanding of the equipment and operating system acquired by the men in charge served as a basis of practical instruction and this, together with installation experience plus operating experience, has resulted in a very high grade of service from the supervisory maintenance crews. Supervisory equipment was selected rather than ordinary automatic equipment since a high type of electric service in a metropolitan area requires immediate supervision to prevent lengthy service interruptions.

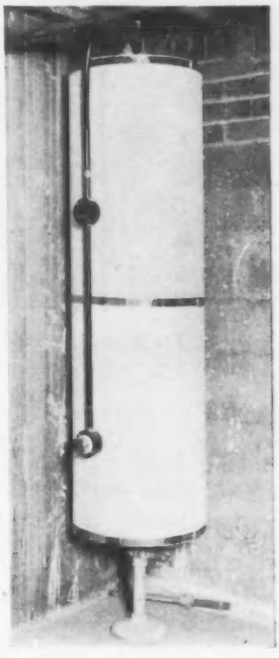
In more than 42 station-months of supervisory equipment service there never has been a service interruption traceable to failure or improper functioning of the supervisory equipment. During this operating period, however, several cases of trouble have arisen through water

entering the control cable between stations, resulting in a shorting and grounding of control circuits. These occasions have required the temporary removal from service of the affected cable until repairs could be completed, usually a matter of but a few hours. Because of the rapidity with which dampness in the control cables disappears when the external moisture condition is removed, these troubles are very difficult to locate and in some cases have cleared themselves before the troubleman could get to the job. The pin-hole punctures in the lead sheath of the control cable have caused practically all of the relatively few operating troubles experienced with the supervisory control equipment. After the first few months of operation, this cable trouble disappears.

As these troubles develop in the control cable the sensitive d.c. ground detector at the controlling station sounds an alarm advising the operator of the trouble condition and the equipment associated with the faulty cable is removed promptly from service. The controlling operator immediately notifies the system dispatcher and the maintenance crew, and a troubleman is dispatched forthwith to the controlled station affected, to remain there as an emergency operator until the supervisory equipment is restored to service.

The installation and operating experience of the Los Angeles Gas and Electric Corporation with its supervisory system shows substantial savings in operating costs per station, and is considered to warrant an extension of the system as new distributing areas are developed.

Analyzing and Solving the Water Heating Problem



PROPER rate, type of equipment, method of installation and operating conditions that will give satisfactory service to customer and profit to utility are essential. Utah Power & Light Company finds sales volume dependent upon (1) satisfactory hot water service to customer, (2) reasonable operating expense, and (3) low installation cost.

IN ARRIVING at a satisfactory solution of the water heating problem in so far as its territory is concerned, the Utah Power & Light Company has contributed a new chapter to the history of water heating progress in the Western states. Water heating development in this territory has been transitory. Varying opinions and varying conditions have led to the development of a wide range of practices. They range from the low-wattage metered-rate and low-wattage flat-rate systems in the Pacific Northwest to the high-wattage metered-rate system employed in California.

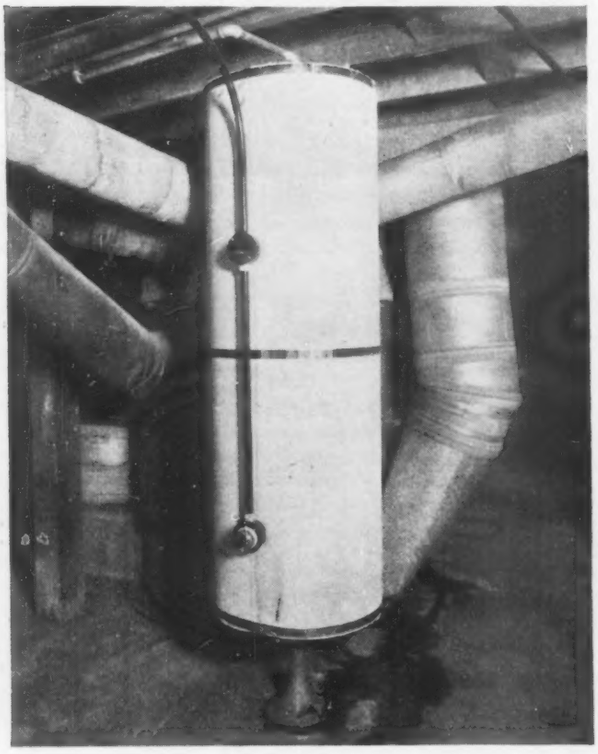
For want of a concerted study of the subject similar to the electric range survey of 1925-26, progress has only been achieved as the result of individual research and study by manufacturers and central stations. Intensive study of all systems in use and research and experiments over a number of years have resulted in the Utah Power & Light Company combining the best features of existing systems into a water heating policy that apparently meets the essential requirements for satisfactory water heating service.

The answer to the water heating problem rests in arriving at definite conclusions as to the proper rate, type of equipment, method of installation and condition

of operation that will give complete satisfaction to the customer and profit to the central station company serving the load.

Two General Systems

It has been pointed out that there are two widely divergent answers to this problem in the Western states.



Installation made in conjunction with air furnaces

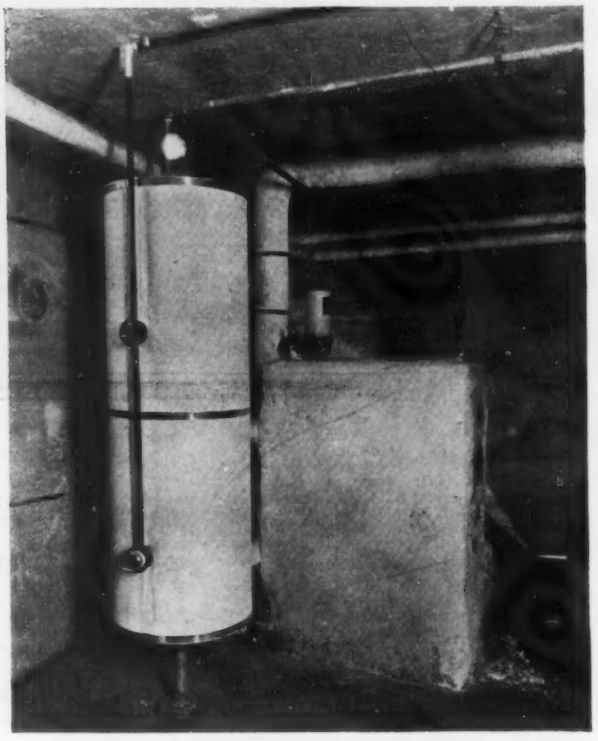
In California there are approximately 15,000 heaters ranging from 3.5 to 6 kw. in capacity operating at metered rates of from 1½ to 3 cents per kw.-hr. These heaters operate either manually or thermostatically and with or without a double-throw switch. The latest figures on consumption show that the heaters furnishing continuous hot water service consume an average of 575 kw.-hr. per month while those operating intermittently use 210 kw.-hr. The annual return ranges from $35 to $46 per kw.

A recent study of present practice in the Pacific Northwest by one of the committees of the Northwest Electric Light and Power Association shows approximately 19,000 water heaters of an average capacity of 850 watts operating on flat rates. Slightly more than 4,000 heaters, 78 per cent of which are of 1-kw. capacity, operate on metered rates. Flat-rate heaters consume an average of 468 kw.-hr. per month and earn a rate of two-thirds cents per kw.-hr. Consumption of metered heaters averages 252 kw.-hr. per month at a rate of 1½ cents per kw.-hr. Eighty-nine per cent of flat-rate heaters are served at rates ranging from $3.25 to $3.50 per kw. per month with monthly revenue ranging from $2.40 to $3.04.

It is common practice to switch the water heater against a part of the range, usually the oven, and 90 per cent of the flat-rate heaters reported are so operated. Tank covers are required by the majority of companies and thermostatic control is optional with the customer. Three of the companies selling flat-rate heaters are concentrating sales effort on booster heaters operated on metered rates to supplement the service of the flat-rate heaters.

Practice of Utah Company

Briefly, those are the water heating conditions in general as they exist in the Western states. For trends and tendencies and for most recent developments the practices of individual companies must be studied. Among the most unique and most recent water heating developments is the program adopted by the Utah Power & Light Company. This company felt that electric water heating to be counted a success must, like every other service, be satisfactory to the customer and attractive financially to the utility. It had found by experience that to bring about sales volume the following three conditions must be met: (1) Satisfactory hot water



Utah installation in conjunction with oil-burning hot-water furnaces

service to the customer, (2) reasonable operating expense, and (3) low installation cost.

In order for the load to be attractive to the utility, proper account had to be taken of such items as load factor, diversity and rates. Finally, the load must reflect favorably upon the net earnings of the company.

In attempting to slove the household hot water problem a series of tests and studies was made over a considerable period to determine the quantity of hot water used for various purposes together with the desirable

temperatures for the various household operations. It was found that the use of hot water in ordinary homes consisted of intermittent small quantities, with occasional use of larger quantities It was also found that the maximum temperature was required for the washing of dishes and clothes and that the requirements of these operations would be met if the water were maintained at a temperature of 160 deg.

By making use of the existing tank in the home and installing a heater about one-third of the distance from the top, operated thermostatically, it was found that a sufficient supply of hot water could be maintained automatically to take care of the ordinary needs of the four-, five- or six-room home. By installing a second heater near the bottom of the tank, which is operated manually by a snap switch, it was possible to provide a supplementary supply of hot water for occasional heavy uses such as laundering clothes. It was believed originally that the lower heater would be used frequently. However, in practice it has been found that more than half of the installations rarely use the lower heater although the customer considers it desirable for emergency purposes.

In larger homes or in cases where partial tank storage is not sufficient a second thermostat is installed on the lower heater to maintain full tank storage. While at first it might have appeared desirable to install thermostats on both heating elements to be sure that the quantity of hot water was at all times more than sufficient to serve the household, experience proved that this arrangement frequently led to waste in the use of hot water with resulting high bills.

The standard installation adopted with the upper unit thermostatically controlled and the lower unit manually operated is in use in more than 1,000 homes on the Utah Power & Light Company's system. This installation has been applied to tanks ranging in size from 30 to 120 gal. with universal success. The standard installation for the ordinary 30- or 40-gal. tank consists of two 1,000-watt heaters. As the use of hot water increases more heater capacity is provided for the larger tanks. The largest installation made so far consists of 4,000 watts total on a 120-gal. tank, the installation operating at about 60 per cent load factor. Individual standard installations in general are operated at from 40 to 60 per cent load factor. Considering diversity due to automatic operation it is believed that the system water heating load factor will be upwards of 80 per cent, which approximates the present system load factor for all classes of business.

Provides Satisfactory Service

Comments from customers show that the installation provides satisfactory hot water service. Intelligent sales work and a certain amount of follow-up to be sure the application fits the home has been necessary. In a small percentage of cases the need for minor changes developed after installation was made. This was due to the fact that it was impossible to arrive at the quantity of hot water and type of service demanded in the home before the installation was made. The company has been frank in stating to its customers that it may be necessary to make minor changes after the initial installation is made.

At the present time the company is using clamp-on heaters with thermostats turning on current at 140 deg. and off at 160 deg. All heaters operate at 230 volts and are connected with two No. 12 wires to the electric range circuit. All wiring is in accordance with the National Code. Water heaters are installed only where electric ranges are served. No double-throw switches or other limiting devices are employed.

The tank cover is constructed of a special paper wound on a mandril and split into two sections. The cover is 2½ in. thick. Pockets are cut on the inside to make room for the clamp-on heaters and the top of the tank is

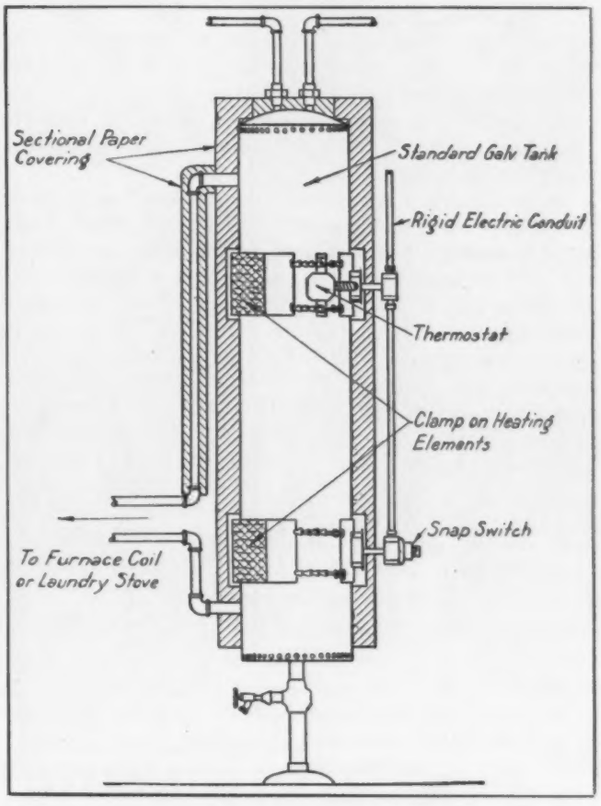


Diagram of standard installation adopted by Utah Power & Light Company

covered with insulating cement after the installation is made. The larger percentage of the homes served are of the one-story bungalow type and the hot water piping from the tank, which is usually in the basement, is horizontal. Tests showed that local circulation between the tank and faucets was so small that it would be unnecessary to provide non-circulating seals in the installation. In fact all items such as pipe covering, seals and the like which would add to the installation expense and sales effort have been eliminated. So far, with approximately a thousand heaters in service, there have been practically no complaints of high bills.

Promotional Type Rate

This water heating service is supplied along with lighting, power and cooking service in the home through one meter under the following rate schedule: First four active rooms $1.25 per month, each additional room 20 cents per month, plus an energy charge of 2½ cents

for the first 300 kw.-hr., and 1½ cents for all additional energy, the rate being net. From the standpoint of the customer, experience shows that the rate available coupled with a reasonable use of hot water results in monthly bills which are in line with the value of the service when compared with other methods of heating water.

The greatest success in selling water heating service has been enjoyed since the company found that it was wiser to discuss total residential service including hot water, than to segregate the hot water item and discuss it separately. The total bill for all lighting, power and fuel seems to be more readily accepted as fair and reasonable. It has been found that the customer's principal interest is in the total cost of running his home rather than in the cost of any single item. If it is possible to show that the total electric bill is not high for the service obtained, then the selling becomes comparatively simple.

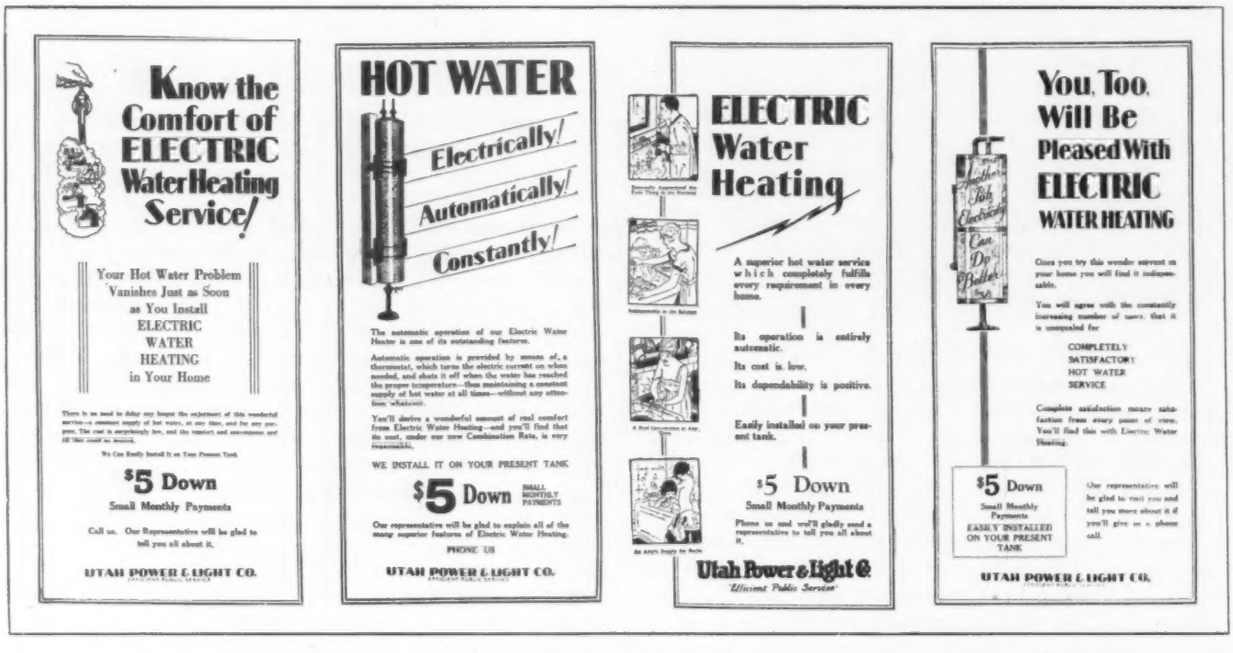
In developing a water heating business the company felt that if satisfactory service could be rendered at reasonable operating costs a fair volume could be secured, but only by employing apparatus which would not entail excessive initial outlay on the part of the customer. Consequently, simple, durable equipment that could be used in conjunction with the galvanized tank already in the home was secured. The complete standard installation for a 30-gal. tank sells for $60 installed, including wiring. This is the price on terms of twelve monthly payments. A discount of 10 per cent is allowed for cash.

Installations larger than 30 gal. have a slight increase in price to provide for the increased cost of the larger tank cover. For very large installations the price is increased to include the material furnished and work performed. In installing the heaters minor corrections in the existing hot water system are made, such as stopping hot water leaks, moving tank from kitchen to basement and other changes that the customer might request. A charge is made for extra services of this character. During the promotional stages of the water heating business all the wiring and piping is being done with company men, although this is not the standard practice in other fields. For the present, the company feels that misunderstandings can be avoided and sales work facilitated if the customer has only one party to deal with during the promotional period.

Overcoming Hard Water Problem

The prevalence of hard water in the territories served by the company was a factor in the selection of satisfactory heating apparatus. Tests were made by the University of Utah which showed scale formation began at 180 deg. F. and increased very rapidly as the temperature increased. Since observations revealed that water above 160 deg. was not necessary in the home the scale difficulty has been avoided by preventing the water from exceeding this temperature. Through the use of the clamp-on heater having a large area in proportion to the wattage, high local temperatures have been avoided.

The success the Utah Power & Light Company is enjoying in the development of domestic water heating business is due largely to the plan of selling water heating service as a part of the service that electricity will perform in the home. Attention is focused on the total residential bill and on the various services that are being performed in the home for this amount of money. The addition of water heating places a very low block in rate structure at the disposal of the customer. Consequently the average cost of all electric service in the home is reduced and additional electric uses come on at a low rate.


Know the Comfort of ELECTRIC Water Heating Service!
Your Hot Water Problem Vanishes Just as Soon as You Install ELECTRIC WATER HEATING in Your Home
$5 Down
Small Monthly Payments
Call us. Our Representative will be glad to tell you all about it.
UTAH POWER & LIGHT CO.
HOT WATER
Electrically!
Automatically!
Constantly!
WE INSTALL IT ON YOUR PRESENT TANK
$5 Down
SMALL MONTHLY PAYMENTS
PHONE US
UTAH POWER & LIGHT CO.
ELECTRIC Water Heating
A superior hot water service which completely fulfills every requirement in every home.
Its operation is entirely automatic.
Its cost is low.
Its dependability is positive.
Easily installed on your present tank.
$5 Down
Small Monthly Payments
Utah Power & Light Co.
"Efficient Public Service"
You, Too, Will Be Pleased With ELECTRIC WATER HEATING
COMPLETELY SATISFACTORY HOT WATER SERVICE
$5 Down
Small Monthly Payments
EASILY INSTALLED ON YOUR PRESENT TANK
UTAH POWER & LIGHT CO.

Newspaper advertising used effectively in selling water heating on lines of Utah Power & Light Company

Sleeping Committees

Stupify Any Organization

By DANA PIERCE

President, Underwriters' Laboratories, Chicago, Ill.

DANA PIERCE, formerly chairman of the N. E. Code-Making Electrical Committee

PRIME in importance from the beginning of any committee's work is the element of time. Neglect of that element reaches into all the forces of the organization.

I am not presuming to criticize this or any other organization. The neglect of that element of time or of prompt action by the officers and the committee chairman is the most destructive thing that can happen to any association.

There must be *action!*

If a topic is assigned to any committee, somebody considers it is worth thinking about. Therefore, the chairman of the committee should give careful consideration to it for the year. There is nothing you can accomplish if you let it go for a year. Committees can absolutely stupify the effectiveness of any organization.

If committees could always hold meetings instead of communicating by correspondence it would be so much better, but that calls for money. During a meeting the committee usually does what it is supposed to do. But it is generally very difficult for the association to act with intelligence when the committee does not function. The result of committee inaction is seen in a gathering like this when a committee gives a report and nobody has the slightest idea what is in it. Furthermore, the association is asked by the chairman to pass judgment on a report of which the members have had no opportunity to know the contents nor in what direction the committeemen have been working.

If you can find time and money to place in the hands of your association at least a part of all its committee reports a month or more before your annual meeting you will be on the road to doing something constructive. If you do not you can come to these meetings not knowing on what a committee is to report. When a motion is made nobody has the least idea what it is about and the association has lost a year.

There is no more discouraging thing than to hold a meeting after conducting elaborate correspondence and then have the committee report turned back simply as a progress report or referred back to the committee—and for what reason? Not for any real criticism of what is contained in it but because the organization as a whole doesn't know anything about it.

Now if a committee reports and takes action, say the report is presented to the members reasonably in advance of the annual meeting, the members then should be in a position to know and hear the objections to the adoption of that report. Then if a member doesn't know what it contains he should have no standing whatsoever. He has had the opportunity to *know* if he has wanted to take it. It follows that only those members who have read and studied and formed an opinion have a real right to act on it.

This is what happens: We have been through the whole thing. I was chairman of the Electrical Committee for four years. Finally we got the Electrical Committee so that its committeemen did their work, and I want to say that we had to lick that committee into doing its job. But let me add that if a committeeman or a sub-committeeman now comes before an Article Committee of the Electrical Committee unprepared, he is in a very awkward position and gets very little sympathy. Likewise, a member who gets up and objects to the report of an Article Committee because he thinks it immature or because he himself has not had an opportunity to study it, gets very little consideration. If the Underwriters or the manufacturers, or anybody else has a representative on the committee that doesn't do his work, none of the other organizations are very enthusiastic simply because he has failed to do his share. People have to do their work or they don't get any credit or any sympathy.

If you want to make your committee discussions and conversations "round table," talk these things over a little together. Then take collective action by vote after all the members have been offered an opportunity to form an opinion other than of the hasty kind that is all that they can form from the reading of a report on the floor.

That is the whole problem. It means work for everybody, but if it is worth while for you gentlemen to take time to attend these meetings you should make it worth while by doing work outside. Then if you will come here having reached some conclusion you will go home and feel satisfied that you have done some good for your association.

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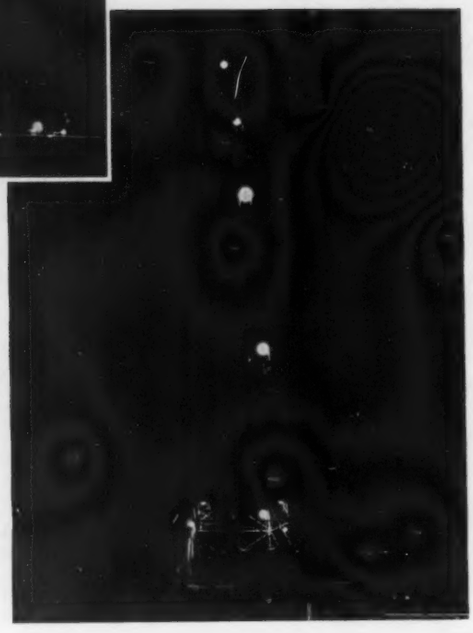
* Excerpts from an extemporaneous talk given by Mr. Pierce on the floor of the sixth annual convention of the Southwest Section, International Association of Electrical Inspectors, San Francisco, Sept. 18-20, 1929.

Oil *needs* LIGHT

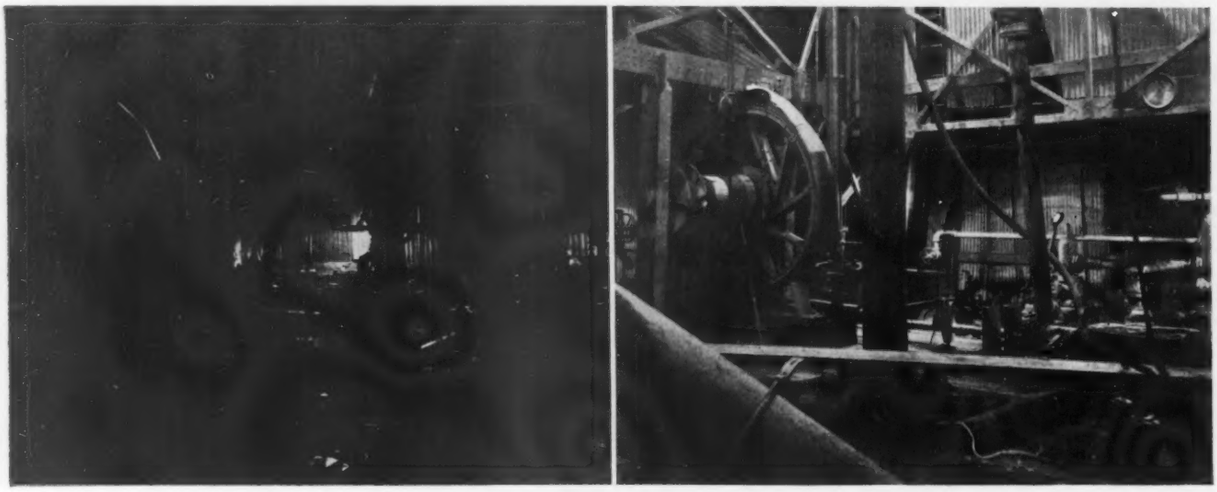
Night as well as day drilling and pumping operations must be done under good lighting

Every truss and member of the steel derrick can be seen clearly now (left) whereas in former lighting practice (below) only a few spots were illuminated by glaring light sources



OIL FIELD operations are carried on 24 hours a day, but the need for adequate artificial lighting for oil derricks and the oil field itself has been somewhat neglected in the mad rush to produce the black gold of commerce. Bernard McParland, electrical superintendent for the Associated Oil Company, and J. Lloyd Kamm, illuminating engineer with the Southern California Edison Company, Los Angeles, have worked out a system of lighting which is now in use on many of the properties of the Associated Oil Company.

In planning the wiring system, Mr. McParland placed the lighting equipment on three circuits, each controlled by a circuit switch with a master switch on the feeder circuit. This makes it possible for the operator to economize on the amount of equipment used. When drilling operations have been completed, the circuit feeding the lamps used in lighting the derrick floor is left intact and in operation, while the other equipment, such as switches, reflectors and lamps used on the two remaining circuits, may be taken down and moved on to the next drilling job.



Before and after the new lighting system was installed

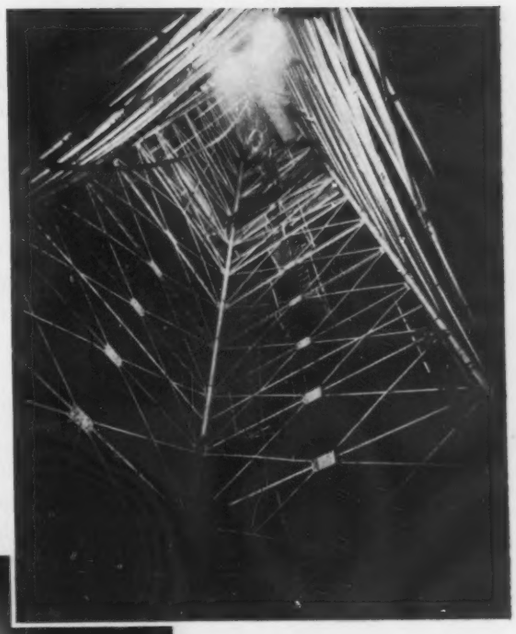
In carrying out the study which developed this advanced type of oil field lighting, it was discovered that the problem divided itself into four distinct and separate divisions:

1. To provide illumination for the men working on the derrick floor. Practically a machine shop problem, with dust and dirt in the air, it requires approximately 10-foot-candle initial intensity.

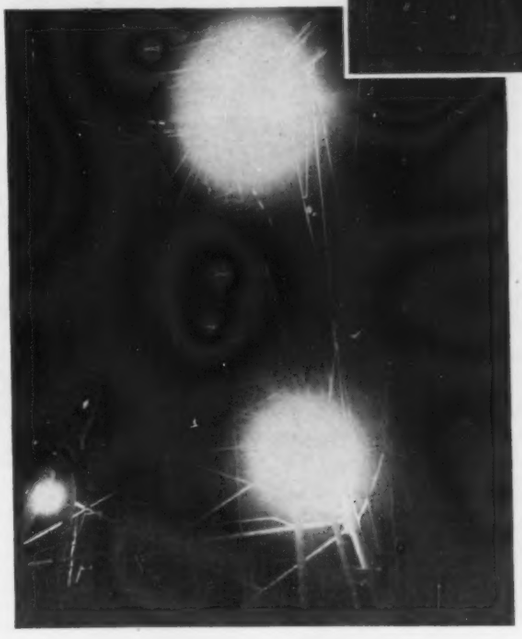
2. Lighting of the derrick so that the man in the tower can see to carry on his own tasks with speed and safety.

3. Lighting derrick so that the driller on the floor can see all operations going on above him. The floodlight projector is directed up the tower to flood the bottom surfaces of all objects.

4. Adequate light on the receiving deck, engine room, pump room, stairways and other portions of the oil rig.



The diagram shown below at right spots the location of the types of units employed, each of which is described in the table below.



To work inside the derrick structure at night was a hazardous task at best when glaring spots of light illuminated only a small area as shown at right. Now, as shown above, there is safety and efficiency in work performed where every detail is visible at night as well as during the day

Types of Units Used

The following description applies to the diagram at the right of this page. Each outlet marked with the letters given below is equipped as follows:

A. Vapor-proof R.L.M. reflector equipped with 100-watt lamp.

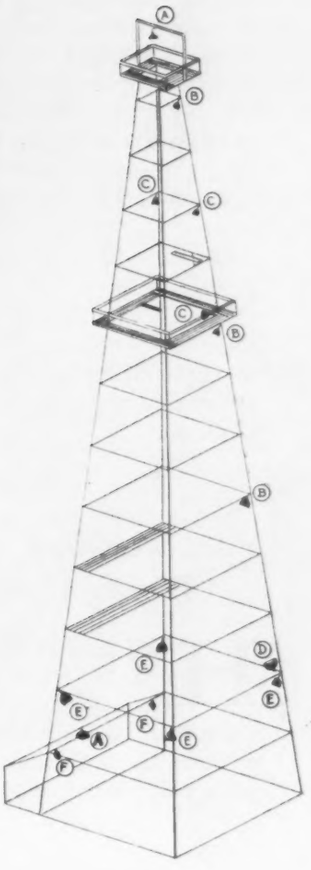
B. Vapor-proof deep bowl reflector equipped with 200-watt lamp.

C. Vapor-proof deep bowl reflector equipped with 150-watt lamp.

D. Floodlighting projector, of weatherproof construction, with a narrow beam and equipped with diffusing cover glass and smooth mirror reflector. A 500-watt P.S.40 clear lamp should be used.

E. Vapor-proof deep bowl reflector equipped with 500-watt lamp and mounted 22 ft. above the derrick floor.

F. Vapor-proof angle reflector with 150-watt lamp.



Electrical West

C. T. HUTCHINSON, *Editorial Director*
G. C. TENNEY, *Managing Editor*

Rural Electrification Schools Warrant More Support

SUCCESSFUL progress in rural electrification depends upon a number of factors, not the least of which is a sympathetic understanding of the farmers' problems by the utilities. Particularly should the men who are charged with actual contact with the farmer know his needs and talk his language.

No better means for training these rural service men and salesmen has been presented than the so-called "short courses" which are being offered by the land grant colleges of the Western states. Such schools are doing more to bring about a unity of understanding between the utilities, the educational institutions and the farmers than any other single factor. The trouble is that few utility executives recognize the value of these schools. Were they to attend even for a day the school recently held by the College of Agriculture of the University of California they would become enthusiastic over the possibilities of these educational activities. To hear lectures on recent rural electric developments followed by heated discussions, to see salesmen and service men testing and operating the very equipment they are to sell the farmer would be all the proof needed.

When the value of these schools is recognized, the colleges will find trouble in providing facilities for all of the utility men, manufacturers' salesmen and contractors operating in rural districts who desire to attend.

Pass the Good Words Along

HALF used is half wasted, even when it is only a magazine. So one contractor learned recently when a journeyman asked if he could take home to read the contractor's copies of his trade publications. Later he found that the journeyman better understood his problems, knew how to perform certain special tasks, and was in many ways more valuable to him.

This suggests the fact that there are many employees of the subscribers of this or any other technical or trade magazine who would welcome the opportunity to see it each month and would become better fitted for their own work thereby. Today's best training school is experience, and the text book of current experience is the trade magazine. No text is as up to date as the last issue of such a publication.

Every branch of the electrical industry must look to its present employees for tomorrow's executives and leaders. An inexpensive and effective means of increasing their useful knowledge is by making the magazines the company receives available to all employees. This doubles the value of the publication and increases the value of the employee. It is good business to drain every ounce of good out of every issue.

Backing Up the Statements That the "Country Is Sound"

EACH business conference called together by President Hoover has swung itself back into line formation with a promise to make extraordinary effort. Each has pledged itself to keep business prosperous and employment continuous despite the "bear" shock which threw the stock market for heavy losses. Meanwhile the cheer leaders have set up a full-throated roar from the rooting section that "the country is fundamentally sound."

As far as the electrical industry is concerned, the utility conference set forth its major construction programs to be undertaken in the new year. Then the large manufacturers' conference declared that production would be maintained in all departmentc. Thus the supply, both of manufactured equipment and of electrical energy, is assured.

Distribution must not lag. It is for this that the entire industry must be mobilized, for without it, supply becomes oversupply and prosperity will be short-lived.

Advertising in 1930 must, if anything, be increased in volume and, needless to say, in intelligent sales direction. Sales forces, if anything, must be augmented and stimulated anew to do an even bigger sales job than in any previous year. Commercial programs everywhere must be keyed to the production and manufacturing programs of utilities and manufacturers, not alone to keep the

cycle of prosperity in motion but to keep the industry's pledge to the nation.

The oratory of "soundness" has been voiced. The performance of good business lies ahead. Business will be sound, will be excellent, if all departments and branches of the industry settle into the harness and bend all their energies to making it so.

Federal Power Commission Reviews Hydro Situation

WHEN the Federal Power Commission critically analyzes present development and future possibilities of hydro-electric power generation, the power industry may expect a worthwhile document. Such indeed is the annual report the commission has just issued. Particularly pertinent are the following conclusions reached in the report:

1. Ten years has developed no particular trend toward steam or hydro power. Hydro continues to supply only a little more than one-third of the nation's electric power.

2. Although an unprecedented era of cheap fuel and remarkable improvements in the efficiency of fuel-using stations has increased the competition between steam and hydro power, there is no justification for the frequent expressions that hydraulic power will be of decreasing importance. Systems hitherto dependent upon hydro entirely are being forced to install a reasonable amount of steam as protection against enforced droughts. The favorable operating and cost relationships of a system with properly balanced steam and hydro capacity have not changed.

3. Lack of constructive public co-operation is one of the greatest obstacles besetting future hydro development. Difficulties which must be overcome before a project can be undertaken appear to be increasing constantly. Litigation over water rights should be determined on sound engineering and social principles rather than upon laws and court decisions that are today inapplicable.

4. Public utility regulation is a matter of state rather than federal activity.

These findings and opinions of the commission represent a clear-cut review of conditions as they exist and corrections that should be made. Such reports as the one just issued are proof of the valuable contributions that the commission has made to the industry since its inception in 1920.

Christmas Lighting Has Transformed Cities

SPRINKLING city streets and residential districts everywhere from Canada to Mexico and from the Pacific to and beyond the Rockies, little colored lamps this year brought color and cheer as never before in history to the Christmas festival time. Entire business districts, in which the brilliant colors of the neon and electric signs mingled with garlands and festoons of bright twinkling lights, were given a beauty never known to cities before.

Of course the millions of Christmas tree lamps have a commercial significance, if such is needed. Nothing is entirely without its commercial aspect. But far greater, and dimming the commercial considerations into such gloom as existed before there were such things as Christmas tree lights, is the social significance of such a widespread use of light. Our cities have been transformed and enriched. Our gardens and homes have been given a new charm and cheer which is scarcely appreciated as yet. Life in all respects has been given a new experience and one with which it will never willingly part.

Happy New Year

Engineering Practice

Joint Underground Service for Residential Area

Standard Construction for Electric and Telephone Service Financed by Subdividers and Taken Over by Utilities as Connected

By CLAYTON BIGGS, Superintendent of Underground Construction, Southern California Edison Company, Los Angeles

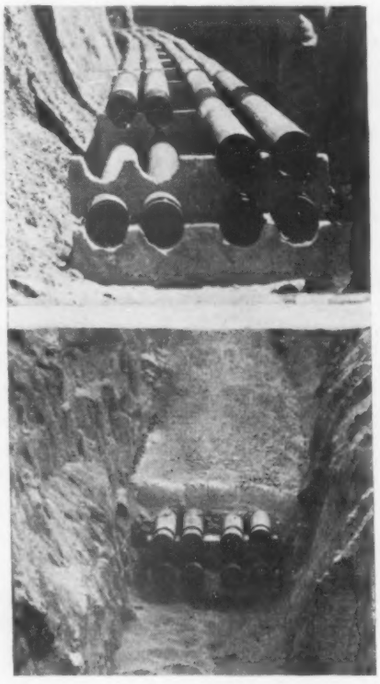
ALL utility service in Hollywood Riviera, a 600-acre high-class subdivision near Los Angeles, is to be supplied through underground conduits. This newly opened, high-class subdivision overlooks the Pacific Ocean south of Redondo, and the underground electric and communication service is considered to add materially to the appearance and value of the property.

The owners of the tract with the assistance and co-operation of engineers of the Southern California Edison Company and of the Associated Telephone Company, evolved a standard combination underground electric power and communication system satisfactory to the utility and adequate to care for an expected heavy loading. Construction of manholes and duct lines was done by J. R. Davies, of Los Angeles, for the owners under contract. The expense of the underground construction was estimated to be about $2.01 per foot of frontage, averaging about $164 per lot, and was borne directly by the property. The installation of distribution feeders will be made as required at the expense of the subdivision. The operating plan calls for a refund to be allowed for each service connection actually made, the amount depending upon the kilowatts connected. However, the maximum allowable refund is limited to the estimated cost of an equivalent overhead distributing system, per service connection. Under these conditions it is expected that the cost to the utilities of serving the tract will be essentially the same as if they had to provide their own overhead circuit facilities. Service leads, transformers, cut-outs and related equipment, of course, will be installed by the electric utility as required.

The total cost of the system for the 600-acre tract will be about $402,000. It is expected that an ultimate total of 2,452 consumers will be served at an average load density of about 53 kva. per square mile.

Because of the expected heavy loading of the lines of both companies, both in the tract and beyond the tract toward the ocean, most of the underground system is of eight-duct construction—four ducts for each company. Standard 3-in. fiber conduit was used throughout with the group of ducts completely encased in a concrete envelope. Precast concrete separators were used to facilitate construction and to maintain uniform duct spacing. A 1:3:5 concrete mixture using pea gravel and mixed wet enough to flow down through the interstices between conduits to the bottom of the trench was used in pouring the envelope. This scheme, together with the elimination of forms for the duct line construction, appreciably speeded up the work and reduced the difficulty encountered in constructing this system in the loose, sandy soil.

Manholes are spaced on an average of about 298 ft. apart and are of two sizes, 4 x 4 x 5 ft. and 4 x 5 x 7 ft., the larger ones serving the junction points. Transformer vaults are provided for in general about every 1,600 ft. and these too were constructed in two sizes, 5 ft.



(*Above*) A section of an eight-duct run laid ready for the pouring of the concrete envelope. Note the pre-cast supports. (*Below*) Concrete envelope cast around an eight-duct run and ready for backfilling. Cast right in the trench, no forms required

Shifting sands and prevailing westerly winds added complications to the construction problem

Duct runs separating to enter their respective manholes. Note the versatility of the pre-cast spacers—an eight-duct pair broken into two parts serves a six-duct separated run

6 in. by 6 ft. 6 in. by 7 ft. and 6 x 8 x 7 ft., according to the expected load to be served from the vaults. The main conduit run and manholes for the most part are placed in the sidewalk areas, or along rear or side lot lines in 7-, 8- and 10-ft. easements. To insure accessibility at all times, all transformer vaults are placed under parkway areas. All service laterals are of standard metal conduit, the minimum permissible size being 1½ in. These laterals are installed from the manholes or vaults to the property line at each lot from which point they must be picked up by individual builders.

Primary feeders, feedbacks, and street light controls are standard, paper-insulated, lead-covered 5-kv. three-conductor cables, while the main power and light secondary circuits will be of standard paper insulated, lead-covered, single-conductor 1.5-kv. cables. Conductors for service laterals for all ordinary demands will be of double braid, rubber-covered, 600-volt, single-conductor cable arranged for fusing in the manhole end, in conjunction with an Edison standard manhole service box. This service box is provided with wiping nipples on one end and suitable bushings to accommodate rubber-covered service on the other. To keep them in the clear in case of possible inundation, they are mounted near the roof of the manhole or vault, above the possible water line.

As before mentioned, all of the cables excepting the series loops for the ornamental street lights will be installed by the Edison company as load requires. "RO" transformers for the street light circuits will be placed in the same vault as are the commercial distribution transformers, using the larger size vaults as feed points for the street light circuits.

A typical eight-duct run being enveloped in concrete prior to backfilling. Note the regular spacing provided by the pre-cast concrete duct supports and spacers

Except for the joint envelope construction in the duct lines, the conduits for electric power service and communication service, together with manholes, vaults and other control points necessary for the two systems, are kept entirely separate.

Double-Decked Turbine-Generators for New High-Pressure Plant

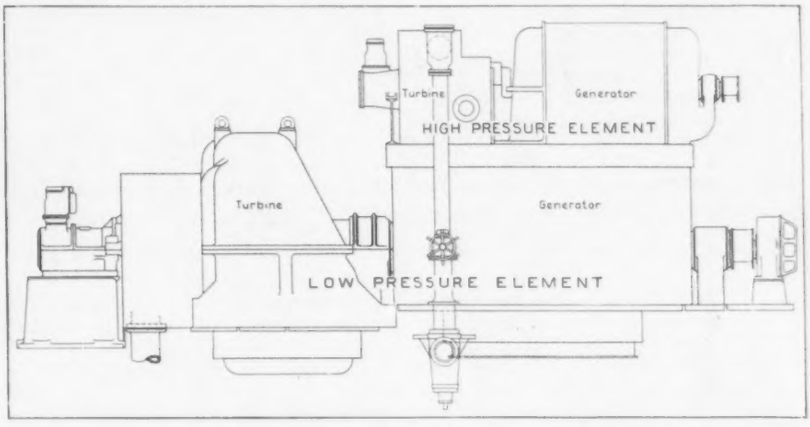
IN ADDITION to being the first high-pressure steam-electric turbine units on the Pacific Coast, the two 1,200-lb. compound turbine-generator sets to be installed by the Pacific Gas and Electric Company at its Station A, San Francisco, also have other design features that are unique and of some interest.

A new type of construction is to be used in these machines in that the high-pressure turbine and generator will be mounted on top of the low-pressure unit, thereby saving floor space and foundation construction otherwise required for the high-pressure unit. The result of this design is a compact unit and engineers having to do with the working out of the details are reported as convinced that this type of construction appears even more advantageous than when first proposed. The high-pressure element is to operate at 3,600 r.p.m. and the low-pressure element at 1,800 r.p.m. The combined normal output rating of these units is variously placed at from 50,000 to 55,000 kw. with a maximum ouput capability of at least 6,000 kw.

In addition to the two main turbines there will be two auxiliary turbines to furnish energy for driving boiler feed pumps and related auxiliaries. The operating and control equipment for these units is to be laid out to permit a flexible operation that will enable the most economical heat balance to be maintained for different operating conditions.

An outline of the general appearance of these double-decked turbine generator units is shown in the accompanying illustration.

At the present time preliminary construction work is under way at Station A and obsolete equipment is being cleared away to make room for the new equipment. As this very interesting plant reconstruction job nears completion "Electrical West" will be in a position to present additional interesting engineering information concerning it.



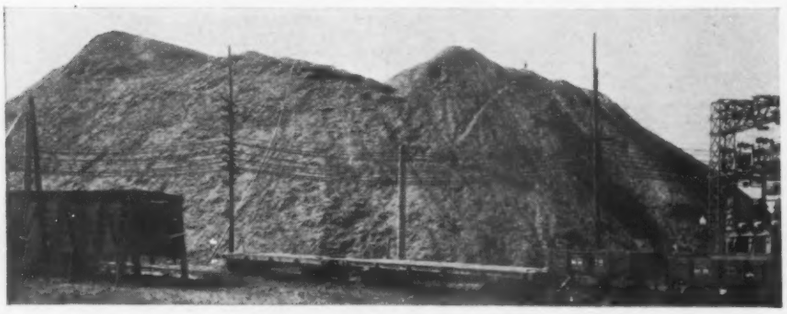
Outline elevation of 50,000-kw. units designed for Pacific Gas and Electric Company's rebuild job at Station A, San Francisco

Meter Readers Versus Dogs

Where vicious dogs on the premises of customers have interfered with normal operating routine and satisfactory service, the San Joaquin Light & Power Corporation has evolved something of a code of procedure. If a meter reader, collector or maintenance man has difficulty in gaining entrance to any premises because of a vicious dog, the owner is promptly notified. If the condition is not remedied and if a number of return trips are necessary to read, test or inspect the customer's meter, the customer is notified that he must confine the dog or provide for the relocation of his meter, or suffer a discontinuance of service as it is economically impractical for the utility to continue the expensive second or third visits, to say nothing of exposing employees to the hazard of a vicious dog.

In some cases this procedure has resulted in a relocation of the meter outside the inclosure or in a box on an alley pole. This relocation usually is done at the customer's expense. In all cases the presence of vicious dogs is noted on meter readers' slips and employees are warned and protected as far as possible.

Thirty Million Kw.-Hr. Worth of Sawdust



FUEL storage pile for Station L of the Portland Electric Power Company, of Portland, Ore. This view shows the hogged-fuel pile as of early August, 1929, at which time it contained 40,000 "units" of 200 cu.ft. each. It was more than 120 ft. high (note the man standing on the skyline) and covered 4 acres of ground. With a conversion factor of about 750 kw.-hr. per unit this pile represents 30,000,000 kw.-hr. of electric energy for Portland.

A Simplified Method of Accurate Meter Test

Manipulation of Double-Pole Double-Throw Switch Introduced Into Meter Leads Gives Complete Check Without Tracing Connections

By M. A. MASON, Meter-Test Department, Los Angeles Gas and Electric Corporation

METER connections may be checked accurately without wire-tracing through the method described in the following paragraphs. The usual connection checking methods, based upon tracing the various leads between meters and instrument transformers in the average three-phase power-metering installation, are not simple at best, and with modern methods of switchboard construction usually involve an appreciable expenditure of time and introduce an undesirable possibility of error. These and other difficulties encountered in several years' experience in three-phase metering have emphasized the definite need for a more simple method of checking connections to current and potential transformers.

The short-cut method described herein obviates wire tracing, simplifies the job and greatly improves the average accuracy of the test. It is especially valuable to the less experienced meterman who otherwise might be particularly subject to certain "natural" errors that would involve appreciable loss of revenue. The method is outlined in eight simple steps of which only four may be required in any particular inspection.

It is well to note particularly that the only limitation experienced in the application of the proposed method is that it is not adaptable to the checking of meter installations where the power load is greatly out of balance.

EIGHT STEPS

Check No. 1—Open the potential circuit of the upper meter element and note the resultant speed of the disk.

Check No. 2—Close the potential circuit to the upper meter element and open the potential circuit to the lower meter element and note the resultant speed of the disk.

Checks No. 1 and 2 may show reverse rotation of the disk with the two different potential circuits separately energized. In that event Check No. 3 is a correction step.

Check No. 3—If the inspection outlined in checks Nos. 1 and 2 shows that the elements do not run at equal speeds and that the fast element is running backward, reconnect the potential of the fast element so as to produce forward rotation. (The potential of the slow element is considered in Checks 6 and 8.)

Check No. 4—Connect a double-pole double-throw switch into the potential circuits of the meter as shown in Fig. 1. (This is a final step in the meter test procedure and should be done in all cases.) In the diagram the current and potential transformer connections are shown just for the sake of making the description clear, although it should be emphasized that it is unnecessary to know how the connections are made to the potential transformers in order to apply this check method. With the switch connected as shown and with the blades thrown down into the lower clip, the resultant meter connection will be nections have not been altered except as found; that is, existing meter conthat leads 3 and 4 are connected together. Throwing the blades into the upper clips will disconnect the load potential wires and reconnect the load side of each potential coil to the line side of the other potential coil. If a stop watch shows the speed of rotation of the meter disk to be the same with the switch in either position, the meter connections were correct as made in accordance with check No. 3.

If check No. 4 as outlined indicates incorrect meter connections, then proceed as follows with the switch blade thrown down into the lower clip:

Check No. 5—If the tests of steps Nos. 1 and 2 show the rotational speed of the element to be the same for the two different potential connections, interchange the potential leads of the two elements, keeping the same polarity. Referring to Fig. 1, this step would be accomplished by interchanging wires Nos. 1 and 2 and interchanging wires Nos. 3 and 4.

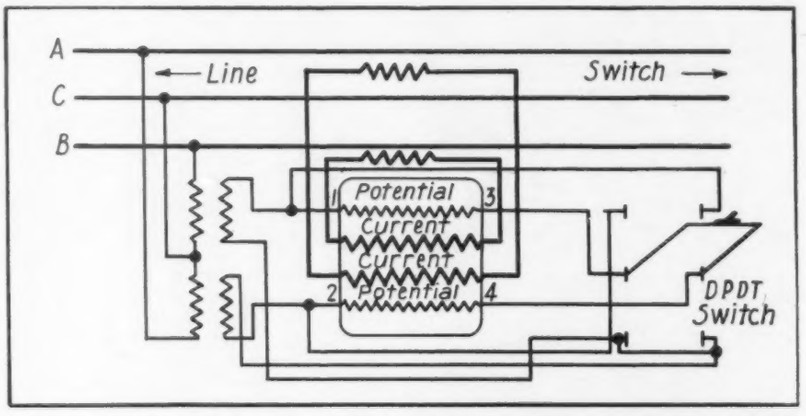


Fig. 1. Typical three-phase meter connections showing method of connecting double-pole double-throw switch into circuit. Manipulation of this switch and observation of the resulting action of the meter under test gives accurate indication of the correctness of meter connections. The switch has the necessary leads fastened to it and designed to fit only in correct connection points in the meter

Check No. 6—If the meter runs ahead after the interchange of check No. 5, reverse the potential leads of the slow element.

Check No. 7—If the meter runs backward after the interchange, reverse the potential of the fast element.

Check No. 8—If check No. 4 shows incorrect connections and if the tests of checks Nos. 1 and 2 did not show the same rotational speed of meter disks for the two different potential connec-

tions, reverse the potential leads to the slow element.

Final Check—Check No. 4 then should be repeated to test the correctness of the changes as made. As previously mentioned, check No. 4 is a final test indicative of ultimate correctness of meter connections and always should be made as a final test.

Proof of Method

The basis upon which this short-cut meter connection test method is built may be analyzed by referring to the vector diagram of Fig. 2 and the connection diagram of Fig. 1. As noted, the three-line wires are designated as phase A, phase B and phase C. The meter current transformers are in

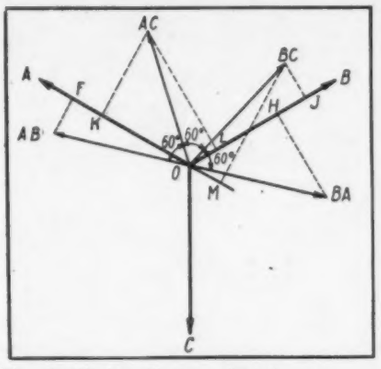


Fig. 2—Vector diagram based upon connections as shown in Fig. 1, and showing basis of proof of correctness of short-cut test method

phase A and phase B, and meter potential is supplied by potential transformers across phase AC and phase BC. Then:

Vector OA represents the load current in lead A as passed through A-phase meter element.

Vector OB represents the load current in B lead as passed through B-phase meter element.

Vector OAC represents the potential between line leads A and C.

Vector OBC represents the potential between line leads B and C.

Torque of the A-phase meter element is represented by the projection OK of OAC on OA.

Torque of the B-phase meter element is represented by the projection of OJ of OBC on OB.

After the connections of a meter have been changed as described by changing the position of the double-pole double-thrown switch shown in Fig. 1, the phase relations of the potential of the two meter elements are changed. Referring to Fig. 2, the change results in shifting the potential vector for A-phase meter element to the position of vector OAB and in shifting the potential vector of B-phase meter element 60 deg. to the position of vector OBA.

With this change the projection OF of OAB on OA will be proportional to the torque on A-phase meter element and the projection OH of OBA on OB will be proportional to the torque of B-phase meter element. It can be proved by geometry that OH = OK and that OF = OJ. Therefore, throwing the double-pole double-throw switch up or down will cause no change in meter speed if the load is balanced and if the connections are correct. The fact that the speeds of the two elements are the same when their potentials are interchanged also can be proved directly from Fig. 2.

After the interchange of potential connections as mentioned, the torque of the A-phase meter element will be proportional to the projection OM of OBC on OA and the torque of B-phase meter element will be proportional to the projection OL of OAC on OB. By geometry OL = OM.

It may be noted that the direction of OM is directly opposite to the direction of OA which, of course, shows that the rotational effort of A-phase meter element would oppose the rotational effort of B-phase meter element and hence the meter would not run unless one of the potentials was reversed. For this reason it is assumed in the foregoing check that if check No. 4 showed something to be wrong and that if the meter were running as found, then it is certain that the potential connections of the meter elements are interchanged and one potential is reversed.

When this condition is found and the potential connections of the two elements have been interchanged so that the proper potential and current are combined on the element in question, the tester may be certain that one element still has its potential reversed. If the meter runs forward after this correction it must be the slow element that is reversed. By the same line of reasoning, if the meter runs backward it must be the fast element that is reversed. Thus after the indicated correcting reversal is made the meter should give a correct registration.

As a final comment, it is obvious that if checks Nos. 2 and 3 show the speed of rotation of the two elements to be unequal, the proper current and proper potential were correctly combined on the proper element and therefore the only wrong connection that could exist would be a reverse potential on the slow element. Thus a correcting reversal of the potential connection to the slow element under this condition should give correct registration.

Modern Design Reduces Turbine Size—Among the physical results of the application of research data to modern engineering is the reduction in size of steam-driven turbine-generator units. Weights have been reduced from more than 70 lb. per kw. of capacity to a present figure of 19 lb. per kw., and the trend is still downward. Floor space required by generating units has been reduced from 150 to 16 sq.ft. per kw.

Combination Line Construction Equipment

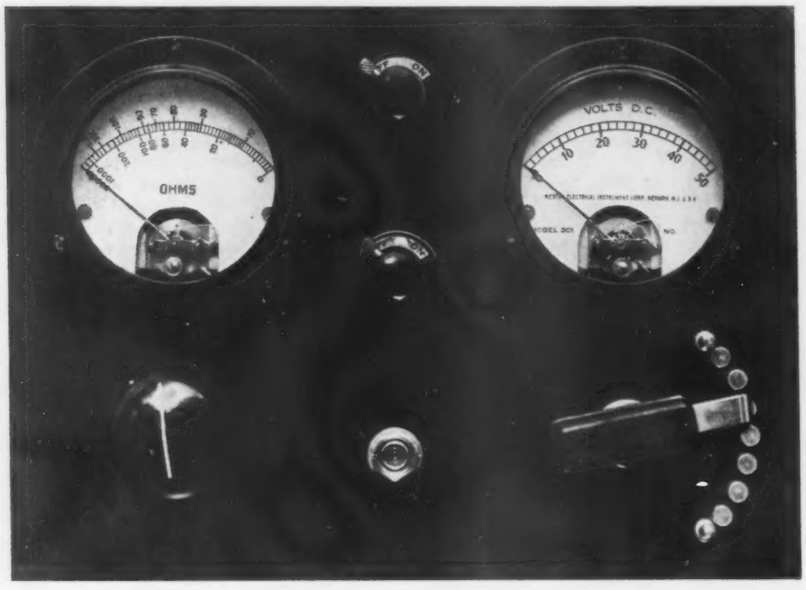
Pole-line construction and pole resetting jobs as encountered by the British Columbia Electric Railway Company, Ltd., in its Vancouver district, are expedited materially by the use of the company's new pole-handling machine. As indicated in the accompanying illustrations, this machine combines pole-hole digging equipment in the form of a power-driven auger and a latticed-steel pole-handling derrick, all mounted on a four-wheel drive truck and powered by the truck's four-cylinder motor. Under ordinary conditions this equipment can sink a 24-in. hole 7 ft. deep in two minutes' time. The equipment has been found satisfactory for hole-digging purposes in any kind of soil that could be dug by hand methods and without blasting. By means of a specially designed auger bit, holes may even be bored through shale rock.

The equipment serves to particular advantage for emergency purposes following a break in a pole line resulting from storm or other accident. The truck and its crew can reset a pole in a fraction of the time formerly required by other methods. Frozen ground or an overburden of soft snow offers little hindrance to the operation of the equipment. The derrick also is used to advantage in pulling old poles and stumps.

Special Device Simplifies Radio Interference Tests

By C. M. LINDSLEY, Radio Engineer, The Southern Sierras Power Company, Riverside, Calif.

IN connection with the tracing and locating of sources of radio interference occurring along its higher voltage lines The Southern Sierras Power Company has used to advantage a special portable instrument. This instrument was developed by the company's engineering department and as indicated in the accompanying illustration comprises a 0-25 milli-ammeter, a variable resistor, a small 90-volt battery and a multipoint battery switch calibrated to give full-scale meter readings of 0-50, 0-500, 0-5,000 and 0-50,000 ohms, the scale of course being reversed.

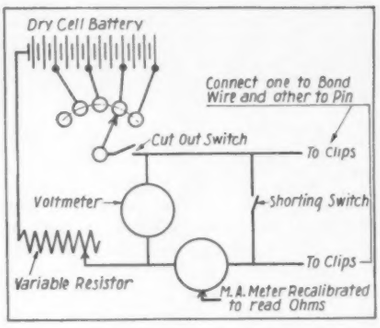


Face view of portable resistance measuring instrument showing the recalibrated, reversed-scale milli-ammeter which gives direct reading in ohms. Extension leads are carried in a small compartment

The need of a light, portable and reasonably accurate means of measuring the resistance between bond wires and insulator pins or other hardware on the pole which might be bonded prompted the development of this device. The cabinet containing the entire equipment is about the same size as the average-sized portable voltmeter, and thus is very easy to carry around. Its accuracy of course is limited to a reasonable approximation and the limit of its use is determined by the maximum voltage available from the small battery. However, experience with this device has shown that its accuracy is entirely suitable for all practical purposes. In fact its readings check surprisingly close with more refined and much more expensive methods of measurements.

Although originally built for high-line bond testing, this meter has lent itself admirably to other uses, including the measurement of grounding resistances. Of course, as mentioned previously, the accuracy is not comparable with that of a Megger or a bridge, but is sufficient for many ordinary tests where extreme accuracy is not paramount.

In operation, the shorting switch first is closed and the variable resistance is adjusted until a full-scale deflection of the meter is obtained for the battery voltage connected. Then the clips are connected across the resistance to be measured or the bond to be checked and the resistance is read directly from the meter.



Connection diagram for simple test meter for locating radio interference sources

NEW BOOKS for the Engineer

BATTLE DECK STEEL FLOOR CONSTRUCTION, published 1929 by the American Institute of Steel Construction, Inc., as Technical Data Bulletin No. 3. A 20-page, 5⅜ x 7¾-in. pamphlet punched for a standard three-ring loose-leaf book.—For all interested in the subject of floor design here is a source of the latest authentic information regarding the subject of welded steel-plate floors. Economic and detailed design data are given, including reference tables.

PROTECTION OF ELECTRICAL CIRCUITS AND EQUIPMENT AGAINST LIGHTNING, Miscellaneous Publication No. 95, U. S. Bureau of Standards, a preliminary report of the sectional committee of protection against lightning, U. S. Department of Commerce. Paper bound; 107 pages; illustrated; 5 x 7¾ in. Published by the Government Printing Office and for sale by the Superintendent of Documents, Washington, D. C. Price 25 cents.—This is a companion booklet to Miscellaneous Publication No. 92 mentioned on page 75 of ELECTRICAL WEST, Aug. 1, 1929. The data published represent several years' work on the part of the co-operating bodies, the American Standards Association, the American Institute of Electrical Engineers, and the National Bureau of Standards, to codify standards for protection against lightning damage.

THE UNIVERSE AROUND US, by Sir James Jeans, M.A., Dr.Sc., LL.D., F.R.S. Cloth bound; 6 x 9 in.; 341 pages, illustrated. Published 1929 by The MacMillan Company, New York. Price $4.50.—Most of us have heard enough regarding the great stellar system of which our known world is such an infinitesimal part to make us wish that we could understand even just a little bit of "what it is all about." Here is a book prepared by a distinguished scientist whose major effort was devoted to writing in words understandable to those not having special scientific knowledge. Remarkable simplicity and clarity have been admirably accomplished, and without injuring the very necessary scientific background of the book. A most interesting and worth-while book.

TRANSMISSION NETWORKS AND WAVE FILTERS, by T. E. Shea, B.S., M.S., member technical staff, Bell Telephone Laboratories. Cloth bound; 6 x 9 in.; 470 pages; 13 tables; 263 illustrations. Published October, 1929, by D. Van Nostrand Company, Inc., New York. Price $6.50.—As with most authentic data concerning the telephone, those presented in this book come largely from the Bell Telephone Laboratories. Originally organized for study courses in that organization, the material and information included in the book subsequently were revised for use at the Massachusetts Institute of Technology. The text is divided into three major parts, having to do respectively with "Principles of Transmission Networks," "Electric Wave Filters," and "Composition of Transient Waves." It is highly mathematical.

HEAVISIDE'S OPERATIONAL CALCULUS as applied to engineering and physics, by Ernst Julius Berg., Sc.D., professor of electrical engineering, Union College, and consulting engineer, General Electric Company. First edition; cloth bound; 214 pages; illustrated; 5½ x 8½ in. Published 1929 by McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York. For sale by Book Department, McGraw-Hill Company of California, 883 Mission St., San Francisco. Price $3.—Interest in and use of Heaviside's operational mathematics is growing with the increasing importance of transient phenomena study as related to electrical transmisison lines and machinery. In this book the author deals with a specialized and limited portion of Heaviside's work in an effort to make available a more generally understandable working basis for a valuable and useful mathematical tool.

A Quarter-Million Yards of Material for Salt Springs Dam

THE ACTION of more than 45 tons of dynamite in one blast is pictured in the accompanying illustration. This blast provided at one shot approximately 265,000 cubic yards of material for the Pacific Gas and Electric Company's new Salt Springs dam which will serve the new Tiger Creek hydro-electric plant.

Forty-one 6-in. holes drilled 160 ft. deep and 21 ft. apart were drilled along the top of a solid granite wall in the quarry. This string of holes was 45 ft. back from the face of the wall and was supplemented by 80 2.5-in. toe holes about 25 ft. deep drilled into the wall at the floor of the quarry. Approximately 50 cases or 1.25 tons of explosive was placed in each of the vertical holes, distributed according to the nature of the rock adjacent to that particular hole. In most cases the topmost charge amounted to about 12.5 lb. and was placed about 15 ft. down from the top of the hole. This upper charge assured a clean vertical break to facilitate further drilling operations.

Cordeau, an explosive fuse, was placed the full length of each hole prior to its loading. As each hole was loaded these lengths were joined at the top of the hole to a length of cordeau which ran the entire 1,000-ft. length of the quarry. These connections were made by splitting the cordeau "risers" and wrapping them around the main horizontal length in much the same manner as two wires would be joined. Electrically fired primers placed at the center of the 1,000-ft. run served to detonate the main string of holes, while individual electric primers were used in each of the toe holes.

The whole group of electrical primers was connected in parallel to a bus which ran the full length of the quarry and to which were connected the leads from the transformer bank which supplied the energy through the control switch. The energy required for the blast was approximately 50 amp. at 250 volts. A knife switch placed in a locked cabinet at a safe point of vantage served as a fire control giving a simultaneous impulse to all primers. To those that had been told to listen for it was noticeable, in very rapid succession, first, the sound of the explosion of the main cap; second, the explosion of the cordeau itself, and third, the explosion of the main charge.

The accompanying illustration was taken from a point of vantage across the canyon approximately a half-mile away. The magnitude of the amount of material that is in motion can best be appreciated when it is considered that the action of the blast was practically equivalent to the instant demolition of two city blocks of ten-story granite buildings.

Electrically operated shovels subsequently loaded this material into electrically hauled trains of dump cars which carried it the few hundred yards to the dam. The shovel that is shown in the lower right-hand foreground is excavating the site for the 15,000-kva. Salt Springs power house unit of the Tiger Creek development.

The dam, when completed, will be the largest of its character known to exist. With a height of 360 ft., a crest length of 1,320 ft. and a thickness at the base of 960 ft., the structure will require some 3,000,000 yards of granite, all of which will come from the two quarries now being operated. The reservoir created will impound 130,000 acre-feet of water to serve the plants farther down the Mokelumne River.

Work at Salt Springs is in charge of P. I. Kurtz, and is under the general direction of O. W. Peterson, engineer of general construction for the Pacific Gas and Electric Company.

Kulmann Nomographs

For the benefit of those particularly interested in the series of nomographs prepared by C. Albert Kulmann and published by ELECTRICAL WEST, we wish to say that the publication of this series will be resumed probably with the March 1, 1930, issue of ELECTRICAL WEST. Mr. Kulmann's protracted illness has interfered unavoidably with the production schedule.—Editor.

Ideas for the Contractor

Series or Multiple System—*Which?*

Why Must Street Lighting Continue an Outworn System?

By S. BINGHAM HOOD, Electrical Engineer, San Leandro, Calif.

EDITOR'S NOTE: *While this communication was sent in as a comment on a previous article on street lighting costs, the question as to whether a series or multiple system should be used in street lighting installations seems to be one which can bear further scrutiny and investigation by the electrical industry. Mr. Hood has pioneered a multiple system and hence may be considered its chief spokesman. What he has to say in his letter opens up the entire matter for constructive discussion.* ELECTRICAL WEST *will be glad to hear more on the subject.*

ON PAGE 303 of the Dec. 1, 1929, issue of ELECTRICAL WEST there is an article entitled "Let Street Lights Burn At Less Cost" which I believe needs a little qualifying to avoid its being used, by those not fully conversant with modern street lighting development trends, to the detriment of their respective communities.

This article is based upon the general, but erroneous, assumption that street lighting and high voltage series circuits are inseparable.

On the assumption used, the figures given may be fair and representative of actual conditions. Certainly the figure of $44 per lamp as the extra cost for dual schedule control with a series system is conservative. The author has, however, used a figure of approximately 16¾ per cent on this as interest and depreciation. With the average mortality of the small isolating transformers used on modern series systems, and the electrical hazard on the high voltage cables, this may not be excessive.

It does seem to me, however, that such a percentage does not exactly match up with what our State Railroad Commission seems inclined to allow. Likewise, the figure ¾ cent per kw.-hr. for energy used after midnight is somewhat out of line with most posted schedules for energy.

Under the assumption that the energy used before midnight must carry the demand element of the rate—and on a cost-of-service basis it must—then the energy value used, ¾ cent, is probably about right. However, if a municipality attempts to buy energy for use after midnight only I doubt if it would be successful in getting quotations as low as that given.

Taking the values as given, and applying them to the 600-candle-power lamp mentioned in the article, it does work out as about an even break. The 600-candle-power series type lamp will require a circuit input of 418 watts as shown by unbiased tests made by the Lynn Gas and Electric Company and published in *Electrical World*, Dec. 29, 1928. This is vastly different from the 310-watt lamp input rating as it shows cumulative losses which total 35 per cent.

> **"The continued perpetuation of the series system, which outlived its justification with the advent of the high candle power incandescent lamp applicable to street illumination, is one of the engineering freaks of our industry that seems to persist in spite of the great advances in efficiency that are being made in other branches of utility work. . . Perhaps it's just a habit that our engineers out here have acquired."**

WHY SERIES CIRCUITS?

The point which I desire to bring out in order to correct any false impressions which readers of this article may receive is that modern street lighting is not by any means a hard-and-fast series circuit proposition.

Utility engineers who have done some open-minded thinking on this subject are no longer using the series system. They do not feel that the progress of the art justifies the perpetuation of a system having inherent losses as high as 35 per cent.

They have adopted a far simpler system that uses energy taken directly from the low voltage mains installed for supply of light to the commercial and residential consumers of the community, whose consumption of energy represents probably 95 per cent of the total lighting demand, including street lighting.

They base their decision on "what is sauce for the goose is sauce for the gander"—in other words, a lighting standard good enough for 95 per cent or more of the total demand is good enough for the 5 per cent or less represented by street lighting.

In that way they avoid the unjustified duplication that series street lighting circuits require, very materially reduce the footage cost for cable, and entirely eliminate the expensive and inefficient isolating transformer that must otherwise be used on both all-night and half-night lamps in order to keep the excessively high voltage away from the lamps and to get "the last straw" in efficiency in the lamp itself.

In addition to the fact that a multiple system is substantially 100 per cent efficient, when figured on a lamp rating wattage basis, it permits the use of an all-night and half-night schedule with practically no increase in the investment cost. The saving, therefore, by using a half-night schedule for part of the lamps is practically that represented by the reduced schedule cost of the energy plus decrease in lamp renewals.

If the figures used in the article under discussion are representative, then a multiple system would save not only the $44 shown for extra cost of dual schedules, but also the isolating transformer on the all-night unit, given as $21.25. This would be an average of over $32 per electrolier.

In addition, the circuit wiring for the multiple system, even with control system and equipment added, will cost less. Moreover, the contact current main circuit transformer, with its high unit cost and poor operating characteristics, can be eliminated.

While comparative costs will vary with different systems and lamp sizes I believe I am safe in saying that an all-night service with the multiple remote control system can be given more cheaply than can a mixed all-night and half-night service using the series system. If a mixed schedule is given with the multiple system then a very substantial saving will result from the use of multiple low voltage supply.

Willys-Overland Company's Los Angeles Plant
Thoroughly Electrified to Speed Production
NEWBERY ELECTRIC CORPORATION
The Sears, Roebuck and Company's Los Angeles
Building a Monument to Modern Construction
NEWBERY ELECTRIC CORPORATION
MIDWICK VIEW ESTATES
Another charming residential
development serviced by NEWBERY
NEWBERY

DIGNIFIED ADVERTISING

How the Newbery Electric Corporation, Los Angeles Electrical Contractors, Reaches a Selected List of Architects and Engineers With a Quality Message Each Month

ELECTRICAL contracting is a subject hard to advertise by any of the usual methods employed in mercantile establishments. Newspaper advertising, except in a limited way and with the possible exception of the small town, is too costly and too widespread for any appreciable results. Even direct-mail advertising, unless handled carefully, is too expensive for its return.

Personal contact is the best salesman for the contractor, without doubt. And where the field becomes too large to make frequent personal contacts, advertising that approaches the personal contact as nearly as possible is next best. In fact it acts as a salesman much better than a prefunctory call and prepares the way for the salesman to make his call count for more than mere contact.

In its advertising the Newbery Electric Corporation, Los Angeles, approaches as nearly a personal call as is possible. Each month a dignified mailing piece, well printed and prepared, is mailed to about 1,200 engineers, contractors, architects and large financial interests. Each mailing piece bears the printed name of the recipient both on the envelope—to his personal attention—and on the tissue fly leaf cover over the mailing piece. This lends the personal touch.

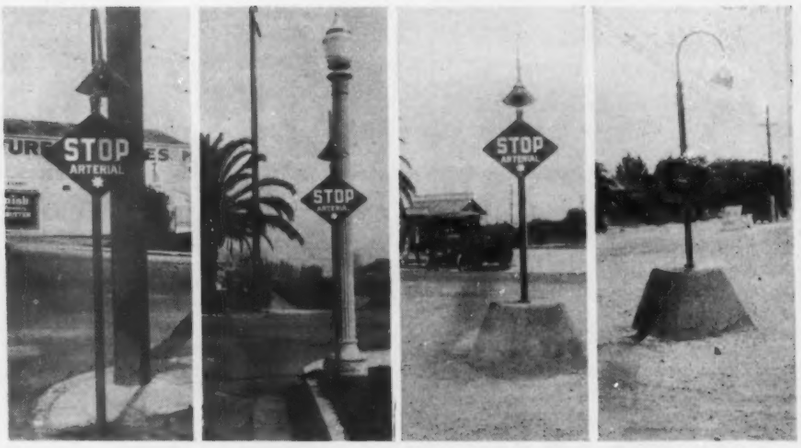
Red, black and silver cover design on the Silver Anniversary brochure issued by this firm

Each mailing piece pictures and describes some recent job wired by the Newbery company, listing on it the name of the architect, engineer, and contractor. A different architect is used each time, if possible. This gives them a feeling of good publicity and strengthens relations with them.

"You realize," says D. D. McFarlane, secretary and treasurer, "that this type of publicity is not expected to bring in immediate results. It is merely selling our name and assisting to build up in the minds of our prospects a picture of the different types of installations that we are doing. The reaction has been very good. We have received quite a number of letters from influential persons commenting on the type of advertising and in some cases requesting additional copies that they may pass them on to other business associates."

STOP LIGHTS DO STOP ACCIDENTS

Fresno Finds System Helps Traffic Control and Costs Little to Install or Operate

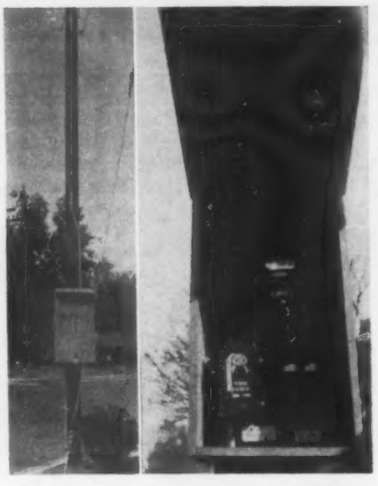


Various types of installation showing mounting of reflector over stop sign on gooseneck pipe, also concrete base for island location

BOULEVARD stop signs, if they are to protect traffic at night as well as during the day, must be illuminated so as to be visible by night as well as by day. Likewise it is desirable to have their night appearance as nearly like their day appearance as possible to prevent confusion. This is the philosophy of the city commissioner of public works, Andrew Jensen of Fresno, Calif. Accordingly George Bowman, city electrical engineer, was asked to light as many of the city's boulevard stops as possible and as economically as possible.

At the present time 190 are lighted and as new signs are located they are being lighted as a matter of course. The results of the first few months' lighting justified the expenditure by a substantial reduction in traffic accidents at the intersections at which it was installed. No recent check has been made but the first check satisfied city officials as to results.

Mr. Bowman sought to design lighting which would make use of standard equipment easily procurable and replaceable. Hence he extended the 2-in. pipe support of the sign,, capped it with a reducing coupling, bent a ¾-in. pipe into a gooseneck, placed it on top of the coupling and extended it over and in front of the sign. It was so placed that with a standard Benjamin porcelain angle reflector equipped with a bullseye, the sign could be completely lighted. Both sign and reflector are inclined from the curb line four or five degrees so as to reflect the light into the motorits' line of vision.

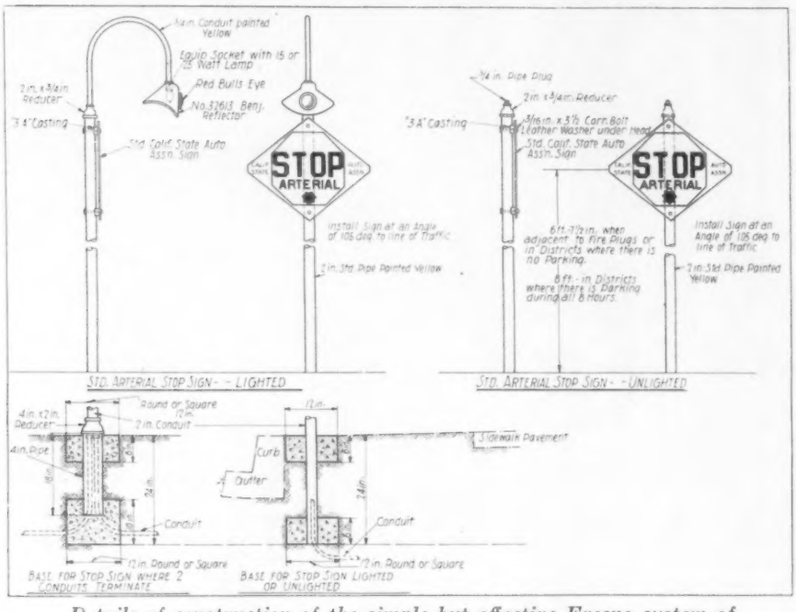


A meter and time clock cabinet for outlying districts

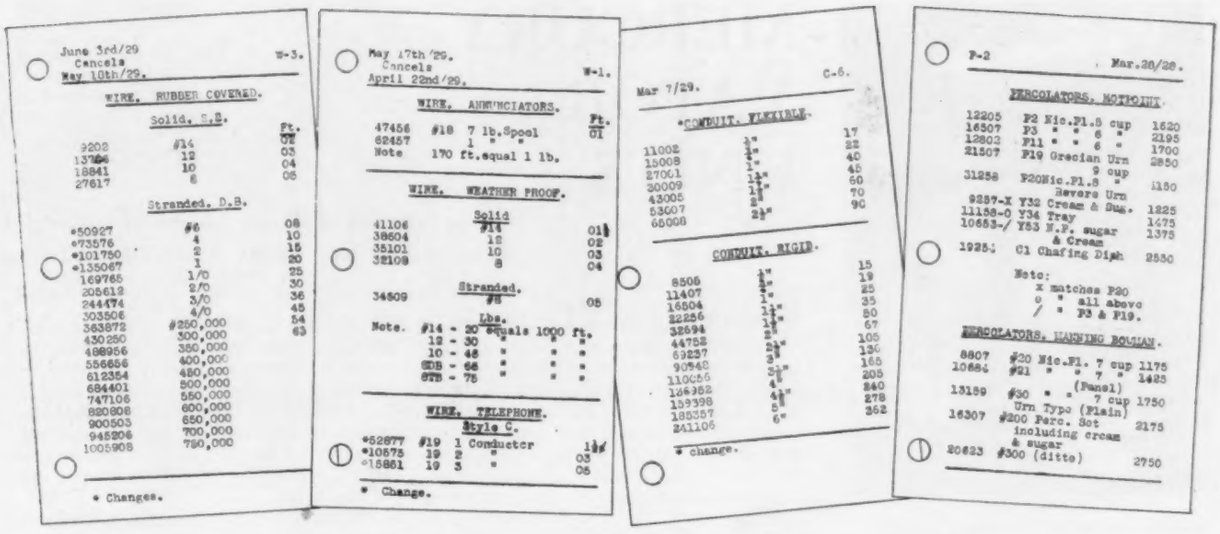
Except in one or two instances a 15-watt lamp in a lock socket lights the stop sign so clearly that it can be seen a mile away. The bullseye also attracts attention. The lighted sign in contrast to the dark street is even more noticeable than in daylight. A flasher button was formerly used in each socket, but because of complaints of radio interference has since been discontinued. The flashing light, however, was even more attention-provoking than ordinary lighting.

Sign standards are set in concrete, sometimes on a reducer and 4-in. conduit, which acts as a pull box at the base of the standard. All circuits to and between signs are run underground in conduit, some runs connecting several signs in one system being very long without materially reducing effectiveness of the light on the sign. All conduit was jacked under the paved streets by city crews without tearing up the pavement.

Cost of sign lighting per pair of posts, including labor and materials, runs from approximately $25 where adjacent to a multiple street lighting system, $50 where adjacent to a series street lighting system, to $75 in outlying sections away from street lighting systems. In the latter cases a separate service and meter are installed in an alley so located as to be within serving distance of several signs. In a locked cabinet on a pole are kept the meter, the switches and fuses, and a time clock which automatically turns on and off the system at nightfall and sunrise. Monthly inspection visits make possible the adjustment of the time clock to seasonal variations in sunrise and sunset time.



Details of construction of the simple but effective Fresno system of lighting boulevard stop signs



Typical sheets from the resale data loose-leaf book, dealing with wire, conduit and appliance quotations

LOCAL RESALE SERVICE

Vancouver, B. C., Contractors' Association Renders Data Service to Members

CONTRACTORS who have habitually made use of a good standard resale service, such as those published by two or three companies and the magazine, *Electrical Contracting*, will appreciate the value which the electrical contractors of Vancouver and other nearby cities in British Columbia place on the resale data service compiled by the Vancouver Electrical Contractors' Association.

Such resale price services as were available were published in the United States and hence not applicable to Canadian prices. No other Canadian list being procurable, J. C. Reston, secretary of the association, after considerable study of other systems, decided that a service of this kind would be a valuable asset to the association.

Accordingly, he prepared data sheets on the "bread and butter" items of the contracting business—wire , conduit, fittings, switches and other staple items. These he circulated among members of the association. Gradually the system was refined and amplified until it now is complete enough for all ordinary job estimating. No attempt is to be made to compile an exhaustive list nor to keep adding to the list.

The form used is a 4 x 7-in. mimeographed sheet, punched to fit a standard three-ring leather binder. As changes in prices of wholesale materials are made revised sheets are prepared with the revised items marked with an esterisk and the sheet dated and sent out to all members and subscribers.

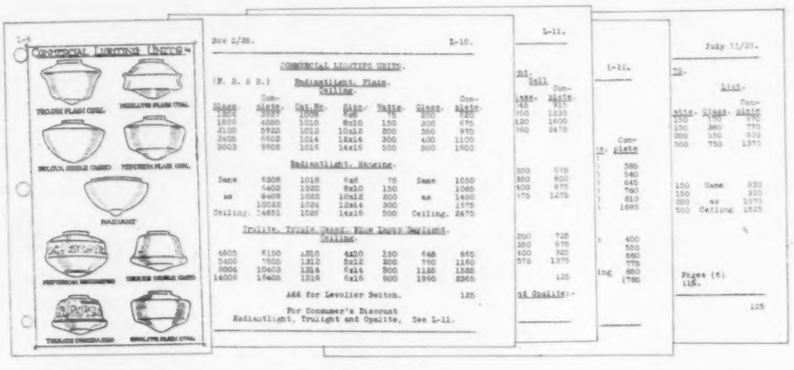
The prices suggested are based on the wholesale cost, which is given in a dummy figure in the first column, plus overhead and profit sufficient to allow discounts for quantity orders. One sheet gives a suggested labor schedule for time up to 100 hours for either journeyman or helper and a discount to apply for time over 100 hours. A basis for time and material work is also given.

Advantages of such a data book are numerous. It is small and compact and can be taken right on the job. Either the proprietor of the foreman can take it to the small job, open it up in front of the customer, list the materials, add them up, and present an accurate estimate. He can explain and sell the items rather than go away and return the next day with a quotation unexplained and mysterious. Use of this book creates confidence in the customer's mind, declares Mr. Reston from experience with it.

Likewise a foreman can carry a copy or a journeyman may carry it to a small job, and on the completion of the work, make out a bill and collect for it on the spot.

The trade in Vancouver makes use of and supports the service. It has been the means of holding the association together even when business conditions have been unfavorable. The jobbers are the best salesmen the association has, says Mr. Reston, in their advocacy of the service. Requests for it have come in from all parts of the province.

Regular members of the assocation receive the service for their dues, which cover the cost. Others requesting it may receive it as associate members by paying production cost.



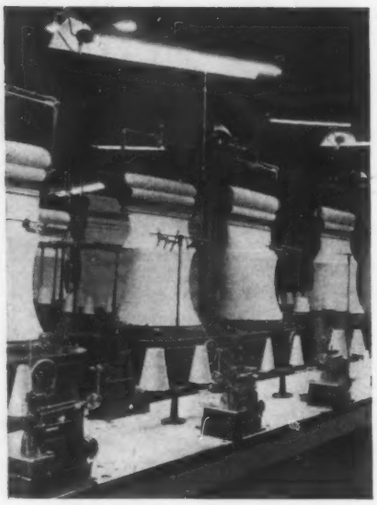
The lighting sheets begin with a drawing of standard units and then give suggested resale prices complete or for parts

MERCURY VAPOR UNITS

Another Article on the Planning and Selling of Lighting

By J. R. WILSON
Quality Electric Works,
Los Angeles

Characteristics of These Means of Industrial Illumination as They Affect Installation



Installation such as that at Gantner & Mattern, San Francisco, where close work on knitting machines is required. Units are suspended from the ceiling

MERCURY vapor arc lighting is different from any other lighting system in general use, employing entirely new principles and fixtures of radical departures in design. To understand thoroughly this statement it will be well to review the claims made by the Cooper Hewitt Electric Company, manufacturers of this system of lighting:

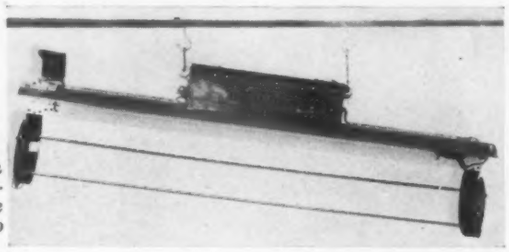
CHARACTERISTICS

"The most striking characteristic of mercury vapor arc light is its color. It is made up of a line spectrum which contains only two groups widely separated. One group contains a pair of yellow-green lines of such energy as to produce 90 per cent of the total effect on the eye. The other group consists of a pair of blue-violet lines which contribute the other 10 per cent of the total.

"Red is totally missing in mercury vapor light. This feature alone accounts for much of the ease of vision under this light. Red light has low visual value and tends to irritate the eye. It also increases the glare effect.

"The yellow-green light is that by which the eye can see easiest. This, together with the monochromatic nature of the light, makes for the high visual acuity of this form of illumination.

"Another feature of the work-light is its large light source. Light is radiated from a tube 1 in. in diameter and 50 in. long. The instrinsic brilliancy of the tube is only about fifteen candlepower per square inch, making it the softest and most diffuse artificial light



Side view of unit, with guards open. Note hanging hooks, with links, one longer than the other to tilt the tube slightly

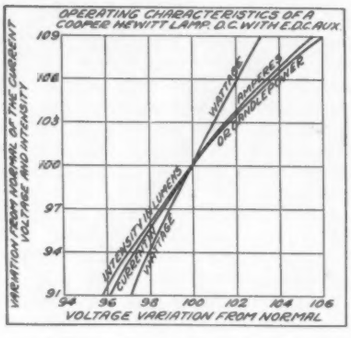
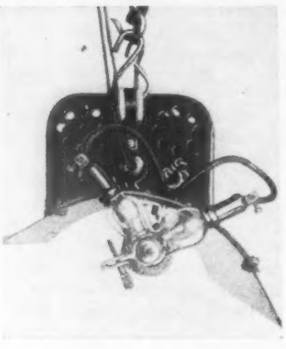
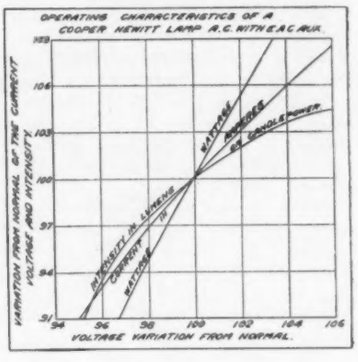


Chart showing operating characteristics of a d.c. unit



End view of an a.c. lamp with the reflector rotated 20°

Below, operating characteristics of the a.c. unit



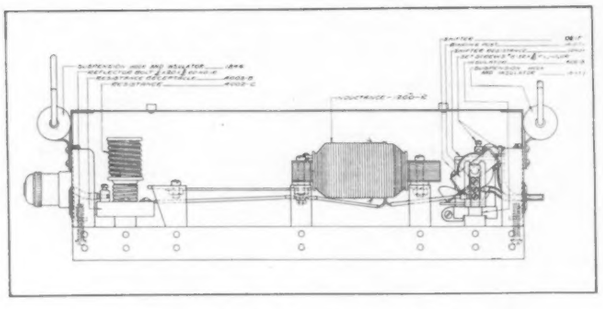


Diagram showing parts in a d.c. lamp

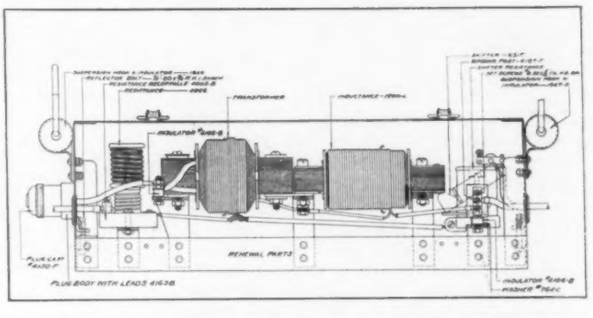
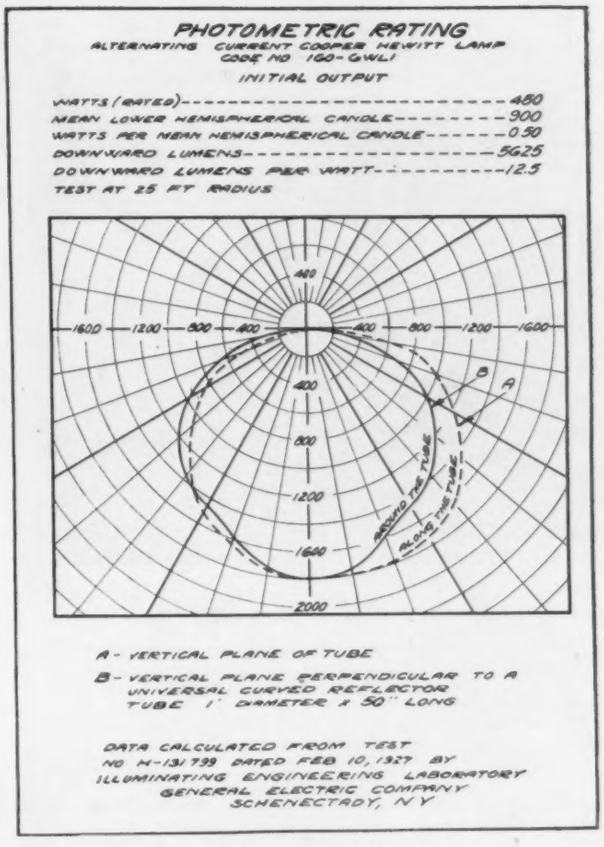


Diagram showing parts of an a.c. lamp auxiliary

Horizontal Distance Between Lamps												
Height	8	9	10	11	12	13	14	15	16	18	20	24
4	55.0	40.4	24.5	23.0	17.9	15.7	11.8	9.7	7.0	5.7	3.9	1.4
5	62.1	55.4	39.6	27.6	21.6	19.7	15.4	12.2	9.2	7.4	5.4	2.3
6	65.2	58.6	42.5	30.7	24.5	22.6	17.8	14.3	10.9	7.8	6.6	3.2
7	65.2	58.4	44.3	33.0	26.5	25.0	19.3	15.9	12.5	9.9	7.7	4.0
8	64.2	57.4	45.0	34.2	28.2	27.2	20.9	17.3	13.9	11.0	9.1	4.7
9	62.1	55.2	43.7	34.8	29.2	28.0	22.0	18.3	15.1	11.9	9.6	5.3
10	59.7	53.0	42.3	34.3	29.6	27.6	22.8	19.1	16.0	12.7	10.1	5.8
11	57.0	50.6	40.8	33.3	29.5	27.0	23.0	19.4	16.6	13.3	10.8	6.2
12	54.1	46.0	39.2	32.3	29.0	26.2	22.5	19.5	16.7	13.7	11.2	6.3
13	51.2	45.6	37.7	31.3	28.3	25.5	22.0	19.4	16.6	14.0	11.3	6.5
14	48.0	42.8	36.2	30.2	27.4	23.8	21.3	19.2	16.4	14.2	11.4	6.6
15	44.5	38.6	34.7	29.1	26.7	23.7	20.7	18.7	16.1	14.1	11.4	6.7
16	40.6	34.6	33.1	28.0	25.7	22.9	19.3	18.2	15.7	13.8	11.2	6.7
18	36.6	33.1	30.0	25.5	23.5	20.9	17.7	16.9	14.9	13.0	10.7	6.7
20	32.6	29.7	26.7	23.0	21.1	18.4	15.2	15.3	13.9	11.2	10.3	6.6
Approximate Watts per Square Foot of Horizontal Surface												
	7.0	5.5	4.5	3.7	3.1	2.5	2.3	2.0	1.7	1.4	1.1	.78

Table II: Intensities produced by 16 mercury vapor lamps symmetrically spaced


PHOTOMETRIC RATING
ALTERNATING CURRENT COOPER HEWITT LAMP
CODE NO 160-GWL1
INITIAL OUTPUT
WATTS (RATED)---450
MEAN LOWER HEMISPHERICAL CANDLE---900
WATTS PER MEAN HEMISPHERICAL CANDLE---0.50
DOWNWARD LUMENS---5625
DOWNWARD LUMENS PER WATT---12.5
TEST AT 25 FT RADIUS
400
800
1200
1600
2000
A
B
A - VERTICAL PLANE OF TUBE
B - VERTICAL PLANE PERPENDICULAR TO A UNIVERSAL CURVED REFLECTOR TUBE 1" DIAMETER x 50" LONG
DATA CALCULATED FROM TEST NO H-131799 DATED FEB 10, 1927 BY ILLUMINATING ENGINEERING LABORATORY GENERAL ELECTRIC COMPANY SCHENECTADY, N.Y.

on the market for industrial work. This means lack of glare at the source and hence lack of glare elsewhere. Thus, when a Cooper-Hewitt lamp gets into the line of vision it does not bother or 'blind' the worker's eyes.

"This large light source also greatly reduces the shadows attendant on any lighting system.

"These features all tend to assist vision and make it easier for the human eye to function at the close work demanded by modern manufacturing methods."

The lighting unit is provided with a long white enamel reflector which can be rotated 20 deg. to either the right or left. Accompanying diagrams give the characteristic curve of light distribution. It will be noted that the highest candlepower is directly under the unit. The fact that the reflector can be rotated makes possible the shifting of the maximum candlepower point to some extent. This feature is useful where vertical surface illumination is paramount. The rotating of the reflector does not change the shape of the curve but displaces it 20 deg. about the light center.

The foot-candle intensities of this light are shown in Table 1 and Table 2. While these tables are based upon ideal conditions, they are accurate enough for general calculations in the majority of industrial installations.

Next month installation methods will be outlined in this section.

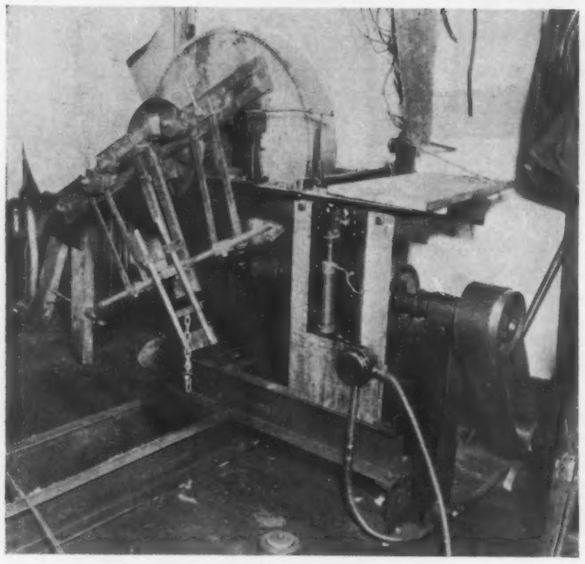
Test measurements on the starting and running currents of Cooper Hewitt light, cycles 60, volts 93-127, amp. 418, watts 450. The readings were taken at a room temperature of 19 deg. C. after the lamp had been out of service for several hours. Readings of applied voltage, and current and power taken by the light, were made over a period of 30 minutes, as shown below.

Time	Volts	Amps.	Watts	Power Factor
0	110.0	11.0	1,250	1.0
20 sec.	111.0	5.2	510	0.88
40 "	111.0	5.5	560	0.92
60 "	109.5	4.7	470	0.91
80 "	110.0	4.65	455	0.89
100 "	110.0	4.50	450	0.91
120 "	109.5	4.50	450	0.91
140 "	109.0	4.55	445	0.90
180 "	109.0	4.50	445	0.91
4 min.	109.0	4.52	445	0.90
5 "	110.0	4.73	465	0.89
6 "	110.0	4.70	465	0.90
10 "	110.0	4.50	445	0.90
15 "	109.8	4.33	420	0.88
20 "	109.0	4.18	416	0.91
25 "	109.7	4.21	413	0.90
30 "	110.0	4.28	420	0.89

The quantities were measured by Weston a.c. voltmeter, a.c. ammeter, and wattmeter.

Table I: Intensities produced by one lamp at various heights and distances

Horizontal Distance in Feet																						
Height	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	25
4	99.0	80.4	58.8	39.2	25.0	15.8	10.5	7.1	5.0	3.5	2.5	1.9	1.5	1.4	1.1	.9	.8	.65	.55	.45	.37	.18
5	59.7	53.4	43.3	32.2	25.2	15.9	11.2	8.1	5.9	4.2	3.2	2.3	1.8	1.7	1.4	1.1	.9	.75	.65	.55	.46	.28
6	41.8	38.5	32.7	26.1	20.0	14.8	11.0	8.8	6.2	4.7	3.6	2.9	2.2	2.0	1.6	1.3	1.1	.85	.75	.65	.55	.28
7	30.7	28.5	25.3	21.2	17.3	13.5	10.5	8.1	6.3	5.0	4.0	3.1	2.4	2.2	1.7	1.5	1.2	1.1	.90	.75	.65	.28
8	23.3	22.1	20.1	17.4	14.6	12.0	9.7	7.9	5.9	5.1	4.1	3.2	2.7	2.3	1.9	1.5	1.4	1.2	1.0	.90	.75	.37
9	18.5	17.6	16.4	14.5	12.6	10.8	8.9	7.4	6.1	5.0	4.0	3.2	2.8	2.4	2.0	1.6	1.5	1.2	1.1	.90	.75	.45
10	14.9	14.4	13.4	12.2	10.9	9.5	8.0	6.8	5.7	4.8	3.9	3.4	2.9	2.4	2.0	1.8	1.6	1.3	1.2	1.0	.85	.55
12	10.3	10.1	9.7	8.8	8.1	7.3	6.5	5.8	5.0	4.4	3.8	3.2	2.8	2.3	2.0	1.8	1.6	1.4	1.3	1.1	.90	.55
14	7.6	7.4	7.2	6.8	6.3	5.9	5.4	4.9	4.2	3.8	3.4	3.0	2.6	2.1	2.0	1.7	1.6	1.5	1.3	1.1	1.0	.55
16	5.8	5.7	5.5	5.3	5.1	4.7	4.3	4.0	3.7	3.4	3.0	2.8	2.5	2.1	1.9	1.6	1.5	1.4	1.2	1.1	1.0	.65
18	4.6	4.6	4.4	4.3	4.1	3.9	3.6	3.4	3.1	2.9	2.8	2.6	2.3	1.9	1.8	1.5	1.5	1.3	1.2	1.1	1.0	.65
20	3.7	3.7	3.7	3.5	3.4	3.2	3.0	2.8	2.7	2.6	2.2	2.2	2.0	1.6	1.4	1.3	1.3	1.3	1.1	1.1	.90	.65
25	2.4	2.4	2.3	2.2	2.1	2.1	2.1	1.9	1.9	1.9	1.8	1.7	1.6	1.2	1.1	1.0	1.0	.9	.9	.75	.65	.55

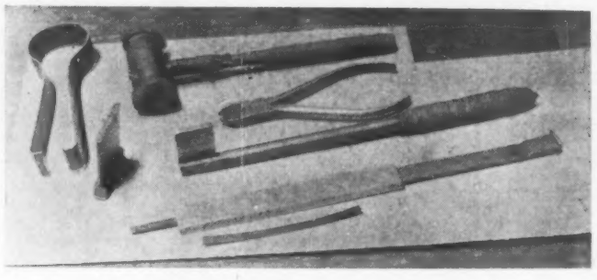


Shaper and Lathe In One

NEARLY every motor shop has its own pet coil-winding apparatus. One of the most complicated and ingenious, however, is that evolved by Tinling & Powell, industrial contractors and motor dealers, of Spokane, Wash.

This combination winding and shaping lathe for large motor coils was made up from standard I-beams and a worm reduction gear.

Fiber bushings are set to predetermined lengths on an adjustable frame. As the coil is being wound the required number of turns one side is held in a wooden form rigidly fixed to the rack. The other side is held in a similar wooden form fastened to a sliding arm hinged at one end. When wound the coil is so pulled out by means of the lower sliding form as to shape the coil to the required shape.



Finishing Tools That Make Neat Work

TOOLS used in the final steps of motor rewinding make all the difference in the world as to the workmanlike finish of the job. The tools shown above are found to be extremely handy in the shop of the California Electric Works at San Diego.

At the left is a handy scraper for the ends of wires to be soldered together. Its sharp edges and spring design make it handy to scrape the end of the wire very quickly. Next to it is a handy tamping hammer made of rawhide.

The next two tools are particularly important ones. Both are used to tamp the coil into the slot to make a compact job. The shape of this metal tamp allows it to be slipped in through the top of the slot and gives a surface on which the tamping hammer may be applied.

The lower tool on the picture is one which has proved extremely handy. It is used to insert strips of fiber along the top of the slot. A strip of fiber is inserted in an aperture at one end of this tool which allows only a short length to protrude. This short length is inserted in the slot and the fiber pushed into the slot by means of the plunger at the other end. The casing around the fiber strip acts as a support at all times and keeps it from buckling or tearing.

motor

a department for and by Motor Specialists

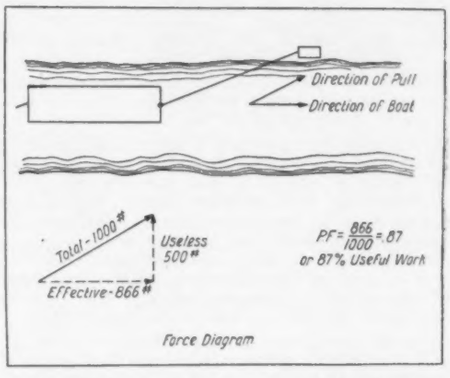
POWER FACTOR

What it Is and How it Is Caused

IN PREVIOUS articles consideration has been given to motor torque and efficiency. The next item of paramount importance is *power factor.* This article will therefore deal with the relation of power factor to motor operation; also with some of the causes of poor power factor, and the means which are advisable for correcting this condition.

Power Factor

What is power factor? It is the ratio between the power (or working) current and the total current supplied to the motor. It is therefore a measure of the utilization of the current furnished. (See force diagram.)



A simple diagrammatic explanation of power factor is that above from a Westinghouse booklet. Just as with a horse pulling a tow boat, only a portion of the pull is effective in moving the boat forward. That portion of his force at right angles to the direction of the boat is useless work. The power factor is the useful work performed

All alternating current motors require current for field magnetization. This current is taken from the source of supply and merely flows through the motor field and back to the line. It is known as a "lazy" current as it does no useful work except to magnetize the motor field.

On the other hand, the power (or working) current is a flow of electricity whose energy the motor converts into useful mechanical work. Therefore, the total current required by an alternating current motor is composed of magnetizing and power current.

Power factor less than unity (100 per cent) is a problem inherent in alternating current power transmission and is a material factor affecting the economy of motor operation. Today low power factor presents a problem in which all managers of industrial plants should be interested because it materially affects the cost of production.

A great many instances are of record where a comparatively slight improvement in plant power factor has resulted in material reductions in production costs. The methods of improving power factor, therefore, become of monetary interest to the wide awake motor dealer.

Lower Power Factor Wastes

All industries feel the effects of low power factor wastes. Many of these wastes are avoidable and can be eliminated

forum

in the interest of a better motor trade

entirely at relatively low cost. Some of the principal wastes, chargeable to low power factor, are as follows:*

1. *Relatively large and costly electrical equipment,* including generators, cables, switches and transformers, the dimensions of which are governed by the total current rather than the power current.

2. *Reduced efficiency* for the whole of the electrical equipment because the copper losses for a given load are inversely proportional to the square of the power factor.

3. *Poor voltage regulation* for the whole system. Lower power factor creates a heavy voltage drop in the factory inside wiring as well as influencing the entire electric distributing system from the power house to the factory. This reduction in voltage (poor regulation) results in many evil effects, such as overheating of motors, decrease in their maximum horsepower capacity, decrease in their starting torque, unsteady speed and shortening of their useful life.

4. *A higher cost for power current* because the initial cost of the electrical system as a whole is relatively high per unit of power current supplied.

The effects of poor regulation caused by low power factor will be noticeable in the manufactured product of any plant because variation of voltage means fluctuation in motor speed. This fluctuation is sufficient in some cases to cause a distinct falling off in production. In other cases, however, a fluctuation in motor speed, while not sufficient to reduce production, will influence the uniformity of machine-made products.

Poor regulation also means poor lighting, which always results when the voltage fluctuates, so that here again low power factor, by causing poor industrial lighting, reduces production and the quality of machine-manufactured products.

Low power factor, by increasing the current required by motors, increases the energy losses in the distribution system. These wiring losses due to low power factor in some cases become extremely large when compared with the total energy required by the plant and in many cases the plant wiring is so taxed by the heavy current that it is too small to give satisfactory service.

An energy loss of 10 per cent may be reached easily with a voltage drop of 3 per cent if the power factor is not corrected. An 80 per cent power factor results in about a 5 per cent energy loss in the wiring system when the measured voltage drop is about 3 per cent, as the following calculation will show.

Sometimes it is thought that if the voltage drop between the source of supply and the motor is 3 per cent the energy loss is also 3 per cent. The fact is, however, that the energy loss is inversely proportional to the square of the power factor, so that if the voltage drop is 3 per cent the energy loss at different power factors will be as follows:

For an 80 per cent power factor: $3\% - 0.64 = 4.7\%$.
For a 55 per cent power factor: $3\% - 0.3 = 10\%$.

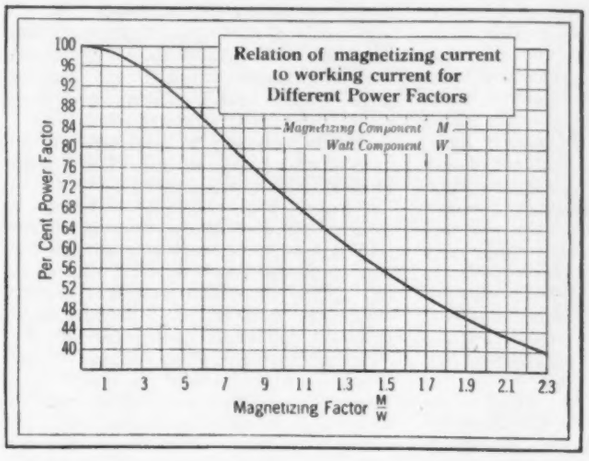
Excess capacity of generators, lines, transformers, feeders, and switching equipment is necessary to take care of magnetizing current. Electrical investment cost varies inversely (approximately) as the power factor, so that a system designed for 70 per cent power factor costs about 40 per cent more than one designed for unity power factor.

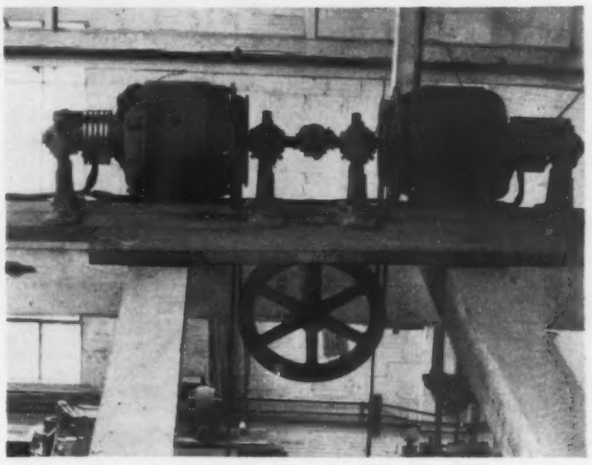
A manufacturer's power rate must contain all of the generating costs as well as a profit on these costs. Therefore, if the power factor on the entire generating system or even on any considerable part of it is low, the manufacturer in his power rate pays the interest charges upon the extra investment caused by that low power factor.

Those of our readers who may desire further information on this interesting subject are advised to write the Wagner Electric Corporation, St. Louis, Mo., and ask for a copy of its booklet, "Fifty Questions and Answers About Power Factor."

(To be continued.)

* Compiled by Wagner Electric Corporation.





Alternating Current Elevator

APPLICABLE particularly to elevator and hoist equipment and promising to eliminate the motor generator sets and exciters common to present elevator equipment is an invention of Philip Mayer, of Mayer & Boyce, San Diego motor dealers. It makes use of two alternating current squirrel cage motors with bases removed and so mounted as to enable both rotor and armature to revolve on a common axis. Both rotors are locked together as shown in the illustration, whereas both armatures revolve in opposite directions. A drum sheave to carry the cable is affixed to each armature.

Each motor is then wound for a different speed; in this case one for 900 r.p.m., the other for 1,200 r.p.m. In operation the effect is of one armature bucking the line, acting as a generator, opposing the other motor and thus providing a true equivalent to dynamic braking of a d.c. motor. When pulling up the elevator cage, on the rotation of one armature the other armature brakes and controls it. In lowering the cage the opposite takes place.

Current is fed to both rotors and armatures by means of collector rings at each end of the common shaft as shown. Four or even three bearings can be made to support the mechanism.

Mr. Mayer claims for it extreme flexibility of control at any desired speed and effective inching control for leveling. The mechanism requires no clutches or gears and is the extreme of simplicity.

A number of other applications are possible with the principle where speed regulation and slow speed are desirable. Many of these are developed by Mr. Mayer in his patent applications. He has been working on the principle for some years and has built several working models of various sizes on which to conduct tests. That shown above is fashioned of two 5-hp. motors and is so smooth in operation that water in a glass carried either on the counterweight or in the cage is unaffected either by starting or stopping.

Better Merchandising

DISTRICT DECIDES AGAINST SELLING "AT COST"

By Clotilde Grunsky

Others in Industry Can Compete on Equal Terms in Salt River Area

IN CONNECTION with most irrigation projects which also have associated with them the development of power, there is a certain amount of merchandising of electrical appliances carried on. Like power companies, the producers of power feel the need of building load through the sale of current-consuming domestic appliances. Moreover, their districts served are in the nature of things purely rural, with, generally, an inadequate dealer service which makes it almost obligatory to provide an accommodation to their membership in the form of a retail sales service.

Unfortunately in most cases such cooperatively managed enterprises suffer from the delusion that it is not necessary to conduct their business on otherwise accepted business principles and that their only function is to enable their members to purchase articles at a discount. As a result, they discourage the entrance of other merchants into their field and themselves do nothing really to push the sale of electrical equipment.

Feeling that the policy of selling electrical equipment on a "cost plus 10 per cent" basis was not a satisfactory answer to its load building needs, the Salt River Water Users Association of Arizona has recently added a merchandising department to its other activities, selling electrical merchandise at standard retail prices, on the same conservative merchandising principles which have been found effective by privately operated concerns.

The Salt River project is unique in the annals of government irrigation projects for its success in meeting its obligations and for the comparatively peaceful and prosperous course of its development. Much of its success is credited to the fact that its leaders have been wise enough to regard the business in the light of a privately owned enterprise, which in fact it is, except that its stock is 100 per cent consumer owner. In other words, it has been operated throughout to make money, not on the theory that its major object was to give something for nothing to its members. The consumers have learned that if the organization is prosperous and profitable, the return to themselves is greater in the end than if they had obtained temporary service below cost but had constantly been called upon to make up deficits. This same principle is what has now been applied to the merchandising department and has been accepted on the same grounds.

During the past few months the Water Users Association has been engaged in a construction program which will, before June first, bring electricity to all of the farms of the valley. If these new lines are to prove remunerative they must develop a load which will mean a general electrification of farms and farm homes. This fact has been pointed out to the members, together with the fact that the new merchandising department now will be in a position to give service not heretofore available on all merchandise sold.

Under the previous system, by which the farmer purchased direct from the wholesaler with a 10 per cent increase, it was necessary to bring an electrical contractor from town to install and to make any necessary repairs. The raise in prices has been accepted with a good grace and with considerable interest manifested by the farmers, particularly those who for the first time are about to enjoy the benefits of electricity.

The company's present set-up calls for a central store, located in the Water Users' Building in Phoenix, where a complete selection of electrical equipment is on display. There are four salesmen in the field, who for the first year, when the sales will undoubtedly be large on account of the new territory opened up, will work on a straight salary basis. Later on the compensation will be salary, plus commissions.

No campaigns are to be conducted, although this may be a development later on, but refrigerators, ranges and ironers are to be particularly pushed. Time payments are allowed only on appliances of $50 value or over. In the case of smaller appliances, combinations amounting to $50 will be regarded as a unit if desired and time payments may be arranged for.

A demonstrator will follow up the sale of all ranges, giving a home demonstration for the new purchaser in her home. She will further conduct a cooking school in the association offices on Wednesday afternoons, giving ironer demonstrations on Tuesdays. Radio is among the articles to be sold.

Contact with the customer is made primarily through the pages of the *Arizona Producer*, a farm paper which is published bi-weekly by the Water Users' Association and which carries several pages devoted to the needs of the farm woman, as well as numerous advertisements of the new merchan-

Set-up Includes:

1. *Central store at Phoenix.*
2. *Four salesmen in the field, on salary compensation.*
3. *Time payments only on appliances over $50 in price.*
4. *Combinations amounting to $50 or over are regarded as a unit and can be had on time payments.*
5. *Demonstrators follow up each range sale; give schools and hold classes.*
6. *Advertising in farm papers.*
7. *Co-operating with power company and respect of territorial boundaries.*
8. *Interchange of prospects with power company in other's territory.*

Some of the typical advertisements carried in the ARIZONA PRODUCER, the farm paper of the district. "The Arizona Farm Woman" pages contain many articles on uses of electricity in the home. Note also the advertisement of a local dealer on the page

dising department. Electrical contractors of Phoenix also make use of its pages for advertising purposes.

The Water Users' Association works on most amicable terms with the Central Arizona Light & Power Company, to which it sells power. The association cannot serve the thickly populated centers, its interests being primarily rural, and so all towns as well as an area for about a mile about their circumference have been conceded as power company territory. The Water Users salesmen do not enter this territory, nor do power company representatives invade the rural districts. Leads obtained in the other's territory are passed over to the other organization for follow-up.

The new set-up of the association's merchandising department has greatly bettered relations with other members of the electrical industry in its territory, who now are able to compete on equal terms and who share in the benefits to be derived from the educational work which is being carried on. Furthermore, selling appliances at a fair profit leaves sufficient leeway to permit of actively pushing their sale. In the end, the association management is convinced that all will prosper, but most of all the farmer who will enjoy a greater service from electricity in his home and in addition will benefit through the success of the Water Users' Association in the revenue it derives from its merchandising department and its rural lines.

Train of Lamps Holds Window Attention

UNIQUE lamp display was made in in the window of the Pacific Gas and Electric Company at Marysville recently by the use of a small electric train and miniature houses, supplemented by miniature house cartons of lamps now being sold as lamp kits. A trainload of lamps in the foreground attracted the attention of passers-by to the unique display.

PRIZE WINNERS

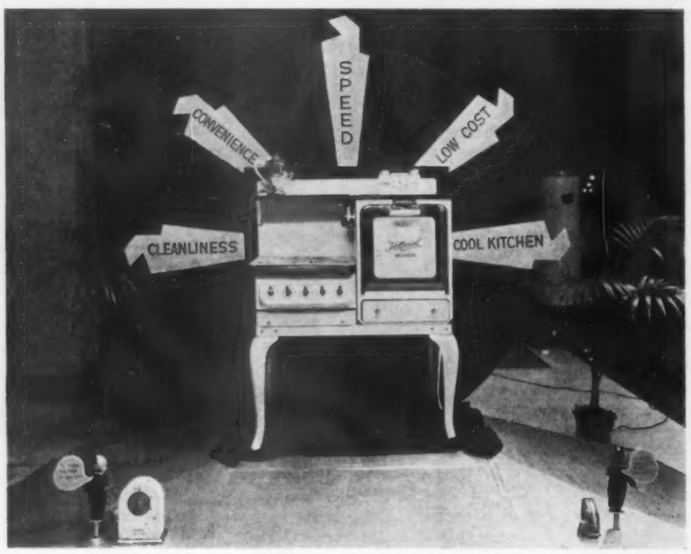
in P. G. and E. District Windows

ABOVE *Miniature city at night and historical cards in front made this the first prize winner. It was decorated by W. H. Meuren, lighting salesman in the Drum division office, Auburn, Calif.*

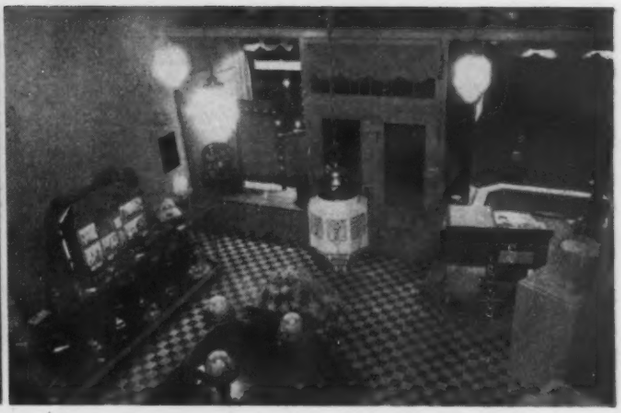
BELOW *Second prize winner, decorated by A. W. Young, chief clerk in the sales department of the East Bay division, Oakland, Calif.*

EDISON week saw each division of the Pacific Gas and Electric Company vying for honors in a window display contest. Rules gave each entrant a $3 bonus, then awarded the prize based on (1) percentage of displays per division, (2) best arrangement of materials furnished (an Edison portrait transparency, nine "evolution of light" cards, crepe paper, cartons and lamps from the local stock), and (3) originality. Response was universal and the judges, P. M. Downing, R. E. Fisher, and H. M. Crawford, had difficulty in deciding winners. Frank Bevan originated the plan and developed it.

OUR ERROR *Unfortunately in the last issue this prize winning window of the Sacramento office of the P. G. and E. Company was ascribed to the Great Western Power Company, just about the worst mistake a publication could make*



MUCH INTEREST *This window was winner of last year's contest conducted by Hotpoint for the entire West. Much interest attaches to this year's contest which has just closed but is as yet undecided. This office was again an entrant in the contest*



THEY CERTIFY—

Two Electrical Contractor-Dealer Stores—First in the State to Be Certified Under the New Commercial Red Seal Standards of the California Electrical Bureau

ABOVE *H. R. Eklund, Electragist, San Rafael, Calif., wired his new store for certification and received the second certificate to an electrical store in the state. Moderistic fixtures, good window lighting and improved shop facilities are provided in the new location*

FIRST *The Central Electric Company at Watsonville was the first electric store to be certified. An attractive place it is, too, with modernistic lighting, elevated display platforms and lowered fixture display ceilings at each side*

FOREMOST *In June Bride window contests Mrs. Stanovich has won almost every year. Ample window facilities are provided in the new store. Note the niches in which to set off large appliances separately in each window*

Two recent window displays at the Building Material Exhibit showrooms in San Francisco, setting forth the qualities of electric heat

Advertising Electric

WINTER months are the most propitious for the sale of electric heat, either of the portable or built-in unit types. It is the time when dealers everywhere, and many power companies, too, concentrate on the sale of this type of equipment. The effort of the San Diego Consolidated Gas & Electric Company, this winter for the first time in its history, is notable in many respects.

A series of large newspaper advertisements called attention to the convenience and comfort of the portable heater as well as the attractive rates recently placed in effect by this company. This played no small part in the success of the campaign.

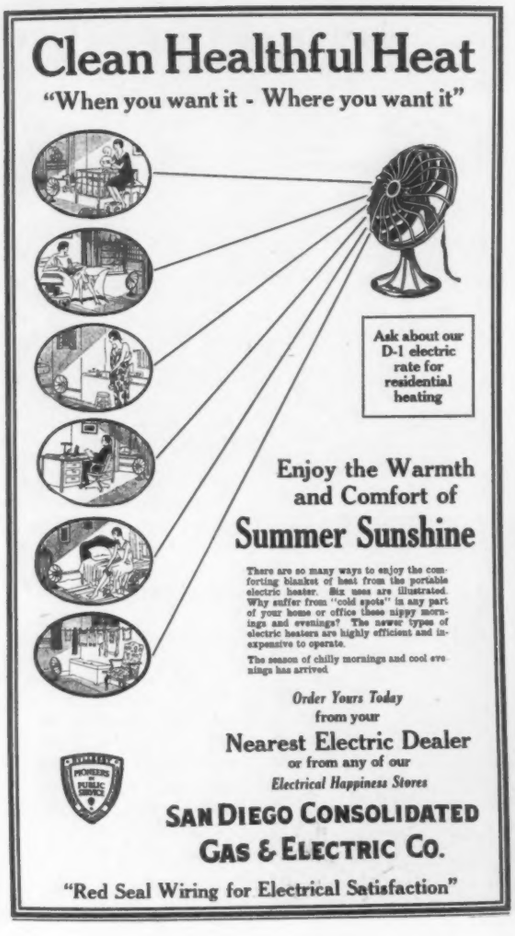
Each advertisement carried a line in prominent type urging the customer to "order a heater today from your nearest electric dealer or from any of 'Electrical Happiness Stores.'"

All salesmen associated with the merchandising department were warned in an emphatic manner not to over-sell the usefulness of the portable heater.

The Pacific Gas and Electric Company, likewise, laid unusual stress upon the adaptability of the portable heater this winter, following a spectacular sale of these appliances last winter. Rotogravure mailing pieces, illustrated dramatically with excellent photographs, carried the comfort idea.

LEFT: *One of the large advertisements of the San Diego company. Note the emphasis on the dealer in the copy.*

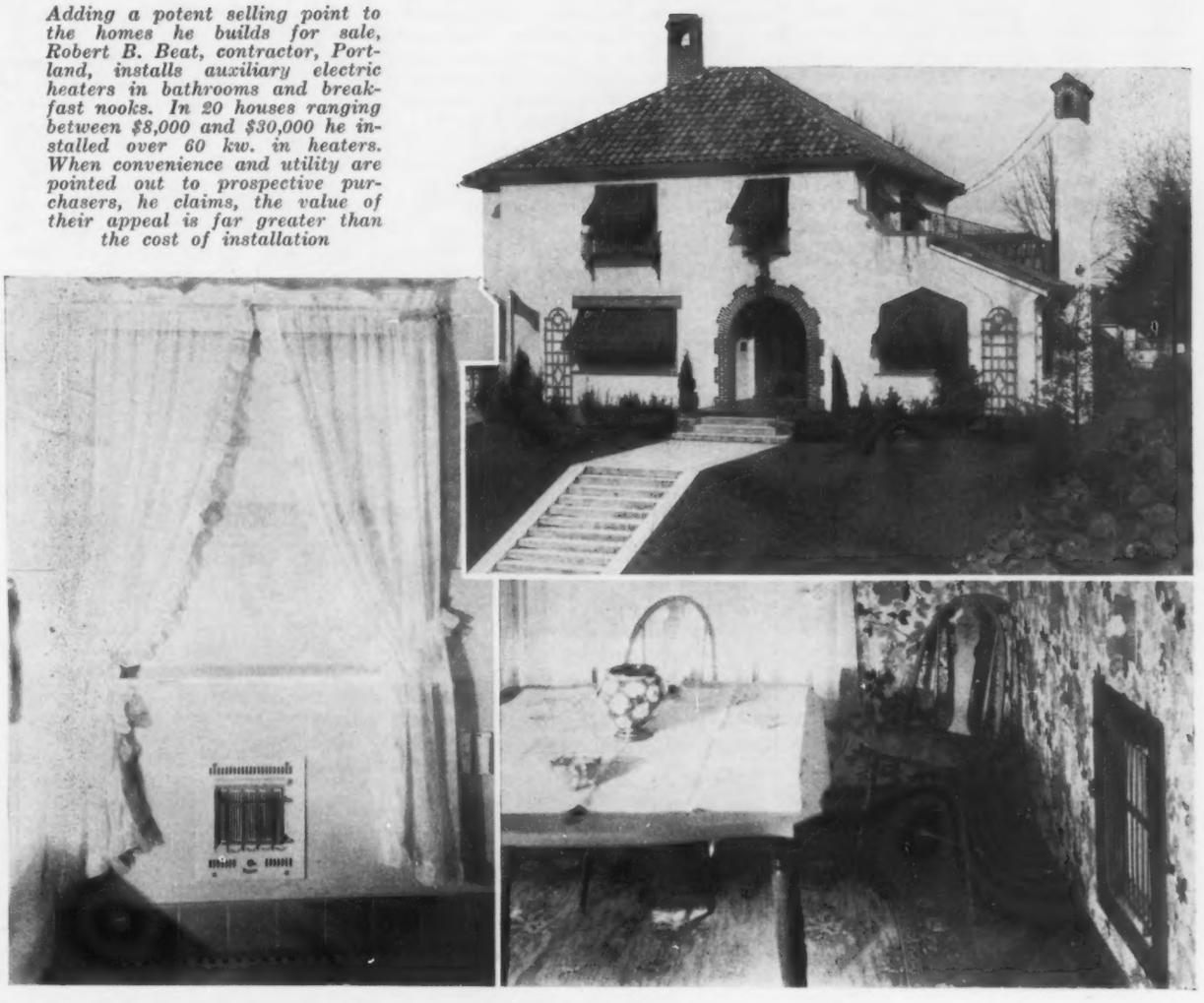
BELOW: *One of the P. G. and E. Company's dramatized mailing pieces*


Clean Healthful Heat
"When you want it - Where you want it"
Ask about our D-1 electric rate for residential heating
Enjoy the Warmth and Comfort of
Summer Sunshine
There are so many ways to enjoy the comforting blanket of heat from the portable electric heater. Six uses are illustrated. Why suffer from "cold spots" in any part of your home or office these nippy mornings and evenings? The newer types of electric heaters are highly efficient and inexpensive to operate.
The season of chilly mornings and cool evenings has arrived
Order Yours Today
from your
Nearest Electric Dealer
or from any of our
Electrical Happiness Stores
SAN DIEGO CONSOLIDATED
GAS & ELECTRIC CO.
"Red Seal Wiring for Electrical Satisfaction"

Heat

Dramatic photographs are employed by P. G. and E. in its broadside advertising pieces. The broadside at the right is being used in a campaign on portable heaters being conducted this winter

Adding a potent selling point to the homes he builds for sale, Robert B. Beat, contractor, Portland, installs auxiliary electric heaters in bathrooms and breakfast nooks. In 20 houses ranging between $8,000 and $30,000 he installed over 60 kw. in heaters. When convenience and utility are pointed out to prospective purchasers, he claims, the value of their appeal is far greater than the cost of installation



News of the Industry

U.S.S. "Lexington" Delivers Power to City of Tacoma Through 20,000-Kw. Hook-Up

THE erstwhile moot question as to whether or not the U.S. Navy would loan any part of the 170,000-kva. power plant of the airplane carrier *Lexington* to the City of Tacoma was decided Dec. 12 when Navy officials wired a proposition to the city offering 20,000 kw. for 30 days. This offer was accepted almost immediately by Mayor James G. Newbegin, subject to ratification by the City Council, and the big ship was ordered to proceed from her berth in Puget Sound near Seattle to Tacoma. The following day the council ratified the arrangement by passage of two ordinances, one authorizing the contract for the purchase of power and appropriating $100,000 to cover all the estimated costs, and the other effecting an agreement with the Baker Dock for berth space for the ship while her power plant was in the service of the city. The same day the *Lexington* glided into Tacoma's harbor, was formally greeted by city officials, and anchored two miles out pending the completion of the physical arrangements for her satisfactory moorage at the dock, which included the driving of dolphins.

On Dec. 18 physical connection between one of the 35,200-kw. generators of the *Lexington* and the Tacoma municipal system was completed, and industries and households were notified by the city that it was no longer necessary for them to cut down on their use of electricity. Street lights, dimmed for several weeks past, burned again with their customary brilliance.

The rate at which the *Lexington's* power was offered to the city was said to be a fixed charge of ¼ cent per kw.-hr. for 20,000 kw. at 50 per cent load factor plus 1 cent per kw.-hr. for the energy actually delivered. The addition of the net cost after salvage of the temporary construction work necessary to hook up the ship's generator, plus the dock charge and other incidentals, was expected to make the cost of the energy taken reach about 1½ cents per kw.-hr.

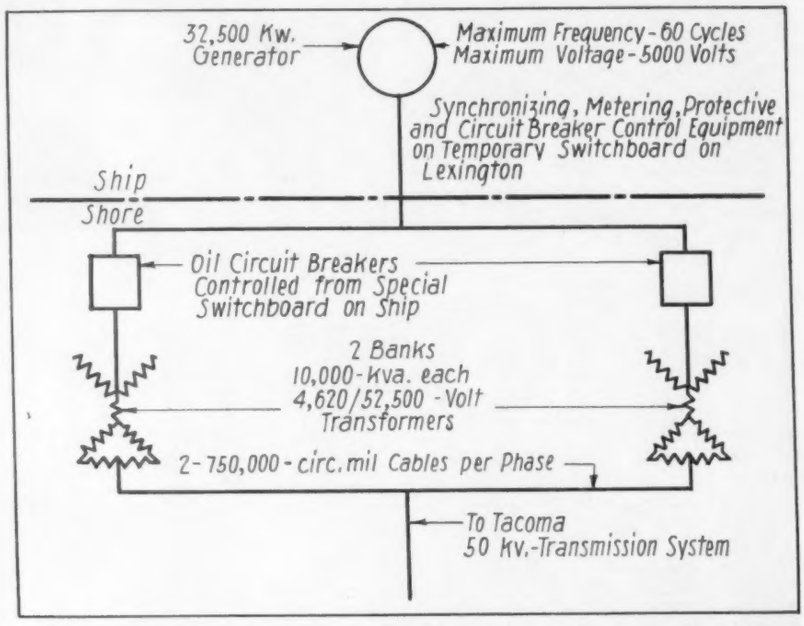
This emergency arrangement will permit the complete shutdown of the City of Tacoma's 40,000-kw. Lake Cushman hydro-electric plant to permit filling of the storage reservoir to a point that will assure adequate power supply for the anticipated period of low water during the freezing weather of January and February. Under the operation of Tacoma's system in normal

The Naval Airplane Carrier, "Lexington"

years the Cushman reservoir fills during the wet seasons and is drawn down during the dry periods. The last time the lake was full and spilling was Jan. 1, 1928. On Dec. 14 last out of a possible 135 ft. of draw-down there were 31 ft., or 7,000,000 kw.-hr. left. Recent rains have brought the flow of the Nisqually River practically to normal so that the plant on that river can carry its full load of 24,000 kw. This is sufficient to carry the night load, and the power from the 9,000-kw. Tacoma steam plant and the 20,000 kw. delivered from the *Lexington* are expected to be sufficient to carry the daily load ranging between 40,000 and 45,000 kw. Short peak loads extending above the average flat day load curve will be available from steam plus assistance from the City of Seattle or from the Puget Sound Power & Light Company.

Some interesting engineering problems have presented themselves in passing 20,000 kw. of the *Lexington's* energy from the ship's transmission system to the city's. The *Lexington* has a draft of 35 ft., and, taking its condensing water out through the bottom skin requires a considerable depth below this draft to avoid sucking up sand and silt from the ocean bottom. These considerations made necessary the choice of the Baker Dock at Tacoma as a berth for the ship where, by breasting the vessel out from the dock 30 ft. by means of barges, a depth of 80 ft. is obtained. Special dolphins and barges have been driven to supply a safe mooring for the ship's enormous hulk.

In brief, the ship's driving equipment consists of four 42,500-kva., or 35,200-kw., three-phase, a.c. generators, developing 180,000 shaft hp. Power from these generators is supplied through suitable controls to eight 22,500/5,500-hp. propulsion motors direct connected in pairs to four propeller shafts. The generators have varying voltages up to 5,000 and varying speeds and cycles up to 1,800 r.p.m., giving 60 cycles at normal load. Seventeen different combinations of operating the generators


32,500 Kw. Generator
Maximum Frequency - 60 Cycles
Maximum Voltage - 5000 Volts
Synchronizing, Metering, Protective and Circuit Breaker Control Equipment on Temporary Switchboard on Lexington
Ship
Shore
Oil Circuit Breakers Controlled from Special Switchboard on Ship
2 Banks
10,000-kva. each
4,620/52,500 - Volt
Transformers
2 - 750,000 - circ. mil Cables per Phase
To Tacoma
50 kv.-Transmission System

Schematic connection diagram showing how much needed power from the "Lexington" was delivered on shore to the City of Tacoma

and motors are possible through pneumatically operated contactors, manually controlled from the control room.

Electrical connection is made by disconnecting the leads of one generator at one motor and tying these direct to a temporary bus structure in the motor room.

Twelve 750,000-circ.mil, single conductor, paper insulated cables tie in at the bus and extend 110 ft. up companion-ways and along passage ways to a door in the skin of the ship some 20 ft. above the water line, then across the intervening space between the ship and the dock, with sufficient slack to provide for a 17-ft. tide. Protection from the weather is provided for the cables by means of wood stave pipe mounted on supporting structures on the barges between the ship and the dock. Generator voltage for the tie-in with the city will approximate 4,600.

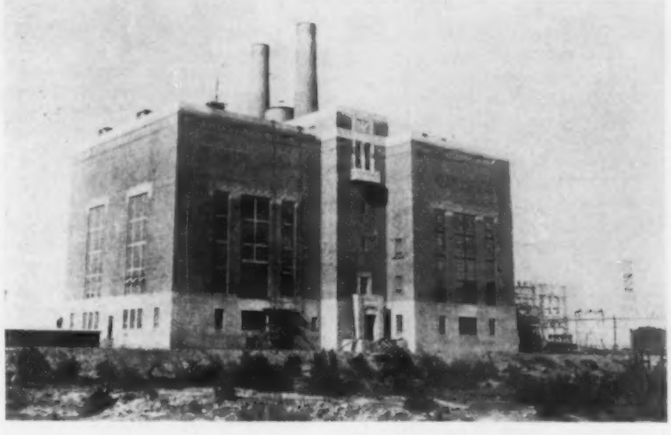
Two transformer banks of identical characteristics, each with its oil circuit breaker, are mounted on two flat cars and run in on the dock track opposite the position of the point of exit of the cables from the ship. Each bank consists of three 52,500 to 4,620-volt delta-star, 3,333-kva. outdoor type transformers, one bank being of air-cooled Westinghouse, and the other of water-cooled Allis-Chalmers transformers. The oil circuit breakers are each 15,000-volt, 1,200-amp. General Electric FH 203, truck-type breakers with a rupturing capacity of 350,000 kva. A housing will be built over these since they are of the indoor type.

The primary side of these banks is connected in parallel to a common bus leading directly to a temporary 50,000-volt transmission line ending at a point on the dock near the transformers. This line, extending principally along Tacoma Ave., is tied in with a 50-kv. tie line between Cushman and Nisqually substations.

For controlling the *Lexington's* power a temporary switchboard carrying synchroscope, voltmeters, ammeter, synchronizing switch, oil circuit breaker control switches with red and green pilot lamps, overload relays, and current and potential transformers has been installed in the ship's control room. The 125-volt control circuit is tapped off the ship's lighting distribution system. The accompanying diagram is tentative and subject of course to change if conditions encountered make any change necessary.

J. L. Stannard, chief engineer, and A. F. Darland, electrical engineer of the Tacoma municipal system, together with Captain F. D. Berrien, commanding officer, Commander J. H. Hoover, executive officer, and Lieutenant Commander H. L. White, chief engineering officer, of the *Lexington*, supervised the hook-up.

New Steam Plant in Operation at El Paso



THE new Rio Grande steam plant erected by Stone & Webster, Inc., for the El Paso Electric Company, El Paso, Texas, recently placed in operation. The construction was completed in eight months, which is said to be a record for a plant of its size. The new plant has an initial capacity of 25,000 kw., and it is planned to raise this ultimately to 150,000 kw. Plans call for the removal of a 15,000-kw. unit from the old plant on South Santa Fe St., and the operation of the two interconnected plants as one unit. The South Santa Fe plant will be used as standby equipment.

The plant is equipped with two 1,525-hp. Babcock & Wilcox Stirling type boilers, each of which has a capacity of 184,000 lb. of steam per hour at 450 lb. pressure per sq.in. at 750 deg. F.

The Rio Grande plant feeds a 66-kv. transmission line and extends to two new substations, Sunset and Austin. Each of these has a capacity of 30,000 kva. and is equipped with two 15,000-kva. transformers. Construction of the plant was in direct charge of R. G. Taber, under the general supervision of J. B. White, resident engineer for Stone & Webster, Inc.

Rain and Snowfall Relieve Fear of Power Shortage

Several days of rain and snow have broken the drought in the Northwest, including British Columbia, and brought relief from what was rapidly becoming a serious water and power shortage.

Snow is also reported in the California Sierra, and a general rainfall in northern California has broken the drought there. Although the power companies of the state were not facing a power shortage, the rain came at an opportune time to augment a rapidly decreasing water supply, greatly to the relief of farmers and stock raisers.

Reports from Colorado state that water in all the streams of that state has been more than ample for all power and irrigation purposes during the 1929 season, allowing plenty of surplus for usual storage purposes. Snowfall far above normal has been precipitated on the eastern watershed which augurs favorable conditions during next year. Oddly, the western watershed which feeds the Colorado River has had less than usual moisture but ground flow as a result of 1928 precipitation has held the flow about normal, though some apprehension is voiced concerning the 1930 supply. The Public Service Company of Colorado, whose two-and-one-half-mile tunnel carries water from the Colorado River to its Shoshone generating station, reports the conduit almost full. The same utility reports its Barker reservoir in Boulder Canyon (eastern watershed) as 60 per cent full despite allowances of water for irrigation purposes all season.

Practically all Colorado hydro plants are equipped with steam standby which has not been used this year because of abundance of water. The Public Service Company of Colorado, which supplies Colorado and parts of Wyoming with 315,000,000 kw.-hr. annually, 146,000,000 of which is hydro, anticipates no necessity for equipment or precautions beyond the ordinary. Loveland, whose power plant froze up during the winter of 1928, Longmont, and Colorado Springs, municipally operated, have experienced none but favorable conditions this year.

A report from Utah made on Dec. 6 stated that the snowfall in that section is considerably below normal but there does not exist at the present time any water shortage, and there is still considerable time for ample snowfall.

ELECTRIC PUMPS INSTALLED ON OIL PIPE LINES—The first installation of electric pumping for oil pipe lines is being made by the General Petroleum Corporation at Belridge, Calif., on its line running south from Kettleman Hills oil fields. Two 200-hp. line pumps will handle the load. Power will be furnished by the San Joaquin Light & Power Corporation.

N.E.L.A. Committees Appointed for 1930 San Francisco Convention

WITH committees appointed to have charge of all preparatory activities, plans for the 53d convention of the National Electric Light Association, to be held in San Francisco June 16-20, are rapidly getting under way. At a conference held in San Francisco during the week of Oct. 14 last and attended by officials of the N.E.L.A. and leaders in the electrical industry in the West, chairmen were selected to head committees charged with every phase of convention responsibility. To each of these chairmen is left the selection of the personnel of his committee.

Members of the general convention committee include:

A. F. Hockenbeamer, Pacific Gas and Electric Company, San Francisco, *honorary chairman*; John B. Miller, Southern California Edison Company, Los Angeles, *associate honorary chairman;* M. S. Sloan, The New York Edison Company, New York, *chairman; vice-chairman*—W. A. Jones, Cities Service Company, New York; F. J. Owens, Oklahoma Gas & Electric Company, Oklahoma City, Okla.; Marshall E. Sampsell, Central Illinois Public Service Company, Chicago; Edwin Gruhl, The North American Company, New York; P. S. Young, Public Service Electric & Gas Company, Newark, N. J.; and the following:

R. M. Alvord, General Electric Company, San Francisco; P. S. Arkwright, Georgia Power Company, Atlanta, Ga.; A. D. Bailey, Commonwealth Edison Company, Chicago; R. H. Ballard, Southern California Edison Company, Los Angeles; George A. Campbell, Sierra Pacific Power Company, Reno, Nev.; Paul S. Clapp, N.E.L.A., New York; Edward H. Coe, Central Arizona Light & Power Company, Phoenix,

A. F. HOCKENBEAMER
honorary chairman, N.E.L.A. Convention Committee

Ariz.; John P. Coghlan, Pacific Gas and Electric Company, San Francisco; J. A. Cranston, General Electric Company, San Francisco; E. B. Criddle, The Southern Sierras Power Company, Riverside, Calif.; Addison B. Day, Los Angeles Gas and Electric Corporation, Los Angeles; F. O. Dolson, The Southern Sierras Power Company, Riverside, Calif.; Paul M. Downing, Pacific Gas and Electric Company, San Francisco;

JOHN B. MILLER
associate honorary chairman, N.E.L.A. Convention Committee

W. R. Emerson, Oklahoma Gas & Electric Company, Oklahoma City, Okla.; R. E. Fisher, Pacific Gas and Electric Company, San Francisco; W. L. Frost, Southern California Edison Company, Los Angeles; G. M. Gadsby, Utah

PAUL M. DOWNING
chairman, N.E.L.A. Convention Executive Committee

Power & Light Company, Salt Lake City; W. E. Goldschmidt, Wagner Electric Corporation, New York; Franklin T. Griffith, Portland Electric Power Company, Portland; Robert B. Grove, The United Electric Light & Power Company, New York; D. E. Harris, General Electric Supply Corporation, San Francisco; M. L. Hibbard, Idaho Power Company, Boise, Idaho; C. T. Hutchinson, ELECTRICAL WEST, San Francisco; A. W. Leonard, Puget Sound Power & Light Company, Seattle; W. P. L'Hommedieu, Westinghouse Electric & Manufacturing Company, San Francisco; A. Jackson Marshall, N.E.L.A., New York; W. R. Marshall, Westinghouse Electric & Manufacturing Company, San Francisco; A. H. Markwart, Pacific Gas and Electric Company, San Francisco; M. A. Pooler, The Tucson Gas, Electric Light & Power Company, Tucson, Ariz.; W. F. Raber, San Diego Consolidated Gas & Electric Company, San Diego; Harry Reid, National Electric Power Company, New York; R. A. Sharon, Great Western Power Company, San Francisco; Guy W. Talbot, Pacific Power & Light Company, Portland; W. G. Vincent, Pacific Gas and Electric Company, San Francisco; A. Emory Wishon, Great Western Power Company, San Francisco.

The wives of members of the general convention committee will act as hostesses of the convention.

The personnel of the executive committee includes the following, who are members also of the general convention committee, given above:

P. M. Downing, chairman; A. E. Wishon, vice-chairman; W. G. Vincent, R. A. Sharon, R. E. Fisher, C. T. Hutchinson, D. E. Harris, A. H. Markwart, R. M. Alvord, W. P. L'Hommedieu, E. B. Criddle, A. Jackson Marshall, John P. Coghlan, J. A. Cranston, W. R. Marshall, W. L. Frost, A. B. Day, W. F. Raber and M. L. Hibbard.

The following, all of whom are members of the general convention committee, have been appointed chairmen

A. E. WISHON
vice-chairman, N.E.L.A. Convention Executive Committee

of the committees named and will select the membership of their respective committees:

Hotel committee—W. G. Vincent; *reception committee*—R. A. Sharon; *entertainment committee*—R. E. Fisher; *publicity committee*—C. T. Hutchinson; *transportation committee* (national)—Robert B. Grove, traffic manager, D. E. Harris, assistant traffic manager; *local transportation committee*—D. E. Harris; *construction and equipment committee*—A. H. Markwart; *personnel supply committee*—W. P. L'Hommedieu; *special lighting committee*—R. M. Alvord.

SOUTHERN SIERRAS POWER COMPANY DENIED PETITION FOR REHEARING ON RATE REDUCTION—The California Railroad Commission has denied the petition for rehearing filed by The Southern Sierras Power Company, Riverside, Calif., on the recent order of the commission reducing the rates of that company approximately $300,000 a year. The new rates have been ordered into effect on all meter readings taken on and after Jan. 16, 1930.

P. G. and E. Convention Revue Announces Sales Plans and Quotas for 1930

AS THE culminating feature of an elaborate and spectacular sales convention and show the 1930 sales program of the Pacific Gas and Electric Company was announced and approved on Dec. 20, 1929. It involves a total of $1,138,000 estimated sales cost, of which $614,000 is to be expended in the development of electric load which it is hoped will exceed 236,889 kw. connected. Estimated annual gross revenue resulting from these sales activities is expected to exceed $6,530,000, or $5.75 per dollar expended. Of a total sales force of 386 men, not including supervisors and managers, 190 men will be employed on electric sales.

Of this electric campaign $203,570 will be expended in the development of electric range, heating, and commercial, industrial and street lighting business, employing 110 men. On industrial heating and power, line extensions and agricultural business 24 men will be in the field, and $144,320 will be used in expanding this load.

Merchandise quotas are set as follows: Ranges, 3,000; water heaters, 1,450; major air heaters, 1,000; auxiliary air heaters, 10,000; floor lamps, 3,000. These are expected to yield an annual revenue of $361,000, from a connected load of 44,080 kw. The company budget sets down an equal amount of load as its estimate of dealer sales in its territory during the year, thus setting the load quota at 88,160 kw. in appliances for 1930.

The sales convention, attended by 600 salesmen and managers, held during the day at the P. G. and E. auditorium, began with an introductory talk by H. M. Crawford, general sales manager, who acted as master of ceremonies. R. T. Stephens, manager of electric sales, reviewed 1929 sales accomplishments, headed by new business buildings signed. In this work 133,500 kw., or 58 per cent more than quota, was signed.

New extensions brought 77,500 kw. of new load, or 72 per cent over quota. Electric appliance sales, including commercial cooking and heating, brought 42,500 kw., or 76 per cent of quota. In this were included 5,144 ranges, of which 2,572 were sold by dealers; 2,430 water heaters, 1,215 of which dealers sold; 1,730 large air heaters, 865 of which dealers sold, and 28,000 auxiliary air heaters, 14,000 of which dealers sold. This represents merchandise value in excess of $880,000.

Street lighting brought 2,100 kw. of new load, or 28 per cent over quota. Commercial and industrial lighting resulted in 3,200 kw., or 83 per cent of quota. Industrial power added 66 per cent over quota with a new load of 9,750 kw. Industrial electric heating additions equaled 4,480 kw., or 89.6 per cent of quota.

In domestic lighting, an activity being pioneered by this company, 2,860 kw. in new load was signed for an estimated annual revenue of $71,500. This was 71 per cent of quota, which, when it is considered that it involved 13,500 transactions and represented $138,000 worth of merchandise sold, averaged $10 per transaction.

Mr. Stephens summed up with these figures: A total of $6,048,500 in new business signed, or 115 per cent of quota; instead of $5.25 in signed revenue per dollar spent there was $6.05 signed. Of this total business dealers were estimated to have done $1,100,000. The total electric revenue was estimated at $3,901,000.

Other features of the sales convention included an analysis of the market possibilities of the territory served by the company, presented by W. P. Bear; a description of the 1930 advertising program, which involves the expenditure of $200,000, by J. Charles Jordan, advertising manager; and an analysis of 1930 possibilities for loading existing facilities, by E. F. Perkins.

Official approval of the entire 1930 program was given by A. F. Hockenbeamer, president of the company, at a commercial department banquet held that evening at which all management officials of the company and members of the board of directors were present. The plans were presented to the management by R. E. Fisher, vice-president in change of public relations and sales.

The banquet entertainment included an elaborate revue with members of the sales department as the cast, which was directed by Frank Bevan of the sales department. During the course of the revue the President's Trophy was presented to the Shasta Division for having achieved the highest percentage of quota during 1929.

NEW RATES—The Los Angeles Gas and Electric Corporation has been granted a permit by the California State Railroad Commission to file electric rate schedules which will make the corporation's rate the same as the rate schedule which the Los Angeles Bureau of Power and Light is to put into effect on Jan. 1. Under this new rate schedule the first block to the domestic consumer will be charged at 4.8 cents per kw.-hr. for dwellings having five or less lighting circuits, and for five kw.-hr. per lighting circuit for each circuit in excess of five.

New Steam Plant Operating in San Francisco

THE new San Francisco steam plant of the Great Western Power Company of California, completed last month after two years of construction work. The building is situated at India Basin on the shore of the bay in the southern section of the city.

Modern in every respect, the new steam plant, representing an investment of approximately $3,300,000, will add 35,000 kw. to the Great Western's generating resources. While designed primarily for standby service augmenting the company's hydro-electric power resources on the Feather River, it will materially benefit the entire system, particularly in the San Francisco Bay area. It will also be available for emergency service for the San Joaquin Light & Power Corporation system, through the Brighton-Wilson tie line.

The main building of the new plant is of steel and concrete structure. The plant occupies a 20-acre site, affording ample room for storage of fuel and other supplies as well as for eventual development, which contemplates three additional units of the same size, giving an ultimate capacity of 140,000 kw.

Plans for the plant were prepared by the engineering department of the Great Western company, while actual construction has been in charge of Harold K. Fox, with the Stone & Webster company as supervising engineers.

Testimony Taken at Pepco Valuation Hearing

Further submissions of exhibits and testimony concerning the valuation of the Portland Electric Power Company consumed the single day's session of the reconvened hearing before the Oregon Public Service Commission in Portland Dec. 2. J. A. Rockwood, testifying for the company, showed the total valuation of the company for rate-making purposes to be about $71,000,000, including street railway property. The commission's engineers had set the valuation at $69,000,000, with the contention that through a further readjustment to be disclosed later this figure might be somewhat reduced.

According to the testimony of the city, speaking through its rate experts, J. W. Carey and Kenneth Harlan, the rate base valuation should be only $57,750,000. This discrepancy between the city's valuation and those of the commission and the company comes about, testified Mr. Carey, through the alleged erroneous inclusion of certain items which the city will contend should not be allowed in the rate base.

Testimony was also introduced concerning the valuation of the street railway system, which was placed by the company at about $15,000,000.

At the close of the session the hearing was again adjourned for an indefinite period to permit interested parties to digest the exhibits introduced and to prepare for cross-examination and rebuttal.

Westinghouse Supply Houses Merged in Single System

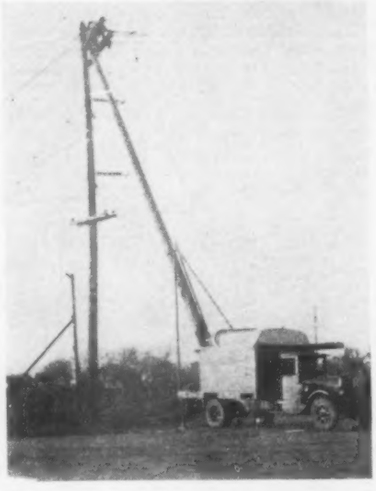
The nineteen wholesale electrical supply companies with branches in 60 cities doing business as distributors of Westinghouse products have been organized by the Westinghouse Electric & Manufacturing Company into a single system under the name of the Westinghouse Electric Supply Company.

Units on the Pacific Coast that have been absorbed into the new system include the Fobes Supply Company, of Portland and Seattle; Fobes Supply Company of California, San Francisco and Oakland; Fobes Supply Company of Montana, Butte and Spokane; and the Illinois Electric Company of California, Los Angeles, Long Beach and Phoenix. Previous to the reorganization, these companies were owned by the Westinghouse Commercial Investment Company, a subsidiary of the Westinghouse Electric & Manufacturing Company, but conducted business under their own names and with their own corporate organization.

One of the objectives of the new system is to secure greater efficiency in the distribution of electrical products, and to this end central reserve warehouses are being established in important distribution centers. These warehouses will serve all of the 60 houses and will make available for quick delivery a broader line of merchandise than it has been possible to carry in the individual warehouses. All houses will, however, continue to carry all electrical and radio merchandise in general demand, as heretofore. In the West warehouses will be maintained at Los Angeles, Portland and Seattle.

The headquarters of the Westinghouse Electric Supply Company are at 150 Broadway, New York City. The officers are A. W. Robertson, chairman of the board, and Walter Cary, president. The operating executives are John J. Gibson, vice-president; B. W. Clark, general manager; A. J. Selzer, director of sales and purchases; Walter Dick, auditor, and W. J. Jockers, general sales manager.

Quick Invention Saves Line When Lightning Hits



OPERATING ingenuity came to the rescue recently when lightning struck one of the 110-kv. lines of the San Joaquin Light & Power Corporation. The high line was put out of commission, but a 10-kv. line below it was unharmed.

The 10-kv. line served several poultrymen who were hatching or brooding chickens by means of electrical equipment. For this reason it was necessary, if possible, to repair the damage without killing the service line, a hazardous job as the repair required the passing of insulators, wire and hardware through the live 10-kv. line.

To kill the line would have been disastrous to the farmers, yet to send men up through it was too dangerous to undertake. This is where operating ingenuity came in. Instead of sending men up through the lines, they went around them. A 50-ft. pole was brought on from Fresno and raised near the line with the top resting against the higher pole, as shown in the illustration. The leaning pole was lashed at the top to the high pole, while the base was tied to the tail of the service truck. This made a safe bridge over which the men could pass outside the 10-kv. line without danger.

Electric Advertising Award Terms Announced

Announcement has been made by the Federal Electric Company, of Chicago, that it will continue its policy, initiated last year, of awarding a purse of $1,000 and a gold medal for the year's outstanding contribution toward electrical advertising.

A medal and purse will be awarded in 1930 at the convention of the National Electric Light Association in San Francisco to the utility company and the individual in that company who will have contributed most to the advancement of electrical advertising during 1929.

Rules governing the award will be as follows:

1. Only members of the National Electric Light Association are eligible to compete for the award.

2. The contribution to the industry may be in the form of a new use for electrical advertising, or it may be in the form of an identification program for a company's various properties. It may be in the form of an enterprise whereby businesses throughout the country or in a particular locality, are brought to a keener realization of the value of electrical advertising, or it may be in the form of an activity which makes possible better merchandising of electrical advertising. Briefly, then, any activity that contributes to the advancement of the electrical advertising industry is eligible for consideration.

3. The gold medal will be presented to the company, while the $1,000 will be awarded to the individual in the company who is directly responsible for the activity that made possible the winning of the award.

The award last year was won by the Edison Electric Illuminating Company, of Boston.

Government Referee Asked to Allocate River Waters

Although no official recommendations were made at the recent conference of Utah, Wyoming, New Mexico and Colorado delegates in Denver, tentative figures revealed at that time suggest that a government referee, to be appointed chairman for a January meeting in Denver, will be asked to allocate Colorado River waters, under the Boulder Dam pact, to upper basin states about as follows:

Colorado, 4,500,000 acre-ft.; Wyoming, 1,500,000 acre-ft.; Utah, 1,000,000 and New Mexico 500,000. This will dispose of the 7,500,000 acre-ft. designated to the four states' use.

It is forecast that the states will have no great difficulty in agreeing on water division, since Colorado, which furnishes approximately 12,000,000 acre-ft., demonstrates a willingness to accept a much smaller amount of Colorado River waters than it might reasonably claim, but a battle is said to be in prospect over utilization of power to be derived from hydro equities.

National Food Preservation Essay Winners Announced

With the announcement of the 835 prize winners and the presentation of the prizes in the essay contest of the National Food Preservation Program the national promotional movement carried on during recent months under the direction of the National Food Preservation Council came to an end in December.

Many thousands of essays had been received at the headquarters of the National Council in New York when the contest closed on Sept. 30. The entries were sorted and classified by a corps of graduates of the Teachers' College, Columbia University, who were all specialists in home economics, and the selection of the winners was made by Merle Thorpe, editor of *Nation's Business;* B. C. Forbes, editor of *Forbes Magazine,* and Dr. Walter Hollis Eddy, professor of physiological chemistry, Teachers' College, Columbia University.

The first prize of $10,000, with an alternative choice of a model home, was won by a young college student who wrote his essay while both wrists were strapped in splints, the result of a fall from a horse. He is Dudley L. Harley, 524 West John St., Martinsburg, W. Va., a senior student in Lehigh University and a candidate for a Rhodes scholarship. He was unable to go back to college at the opening of the fall semester, because both wrists had been broken in his fall. While he was waiting for the broken bones to mend he became interested in the contest and wrote the essay which won him $10,000.

The winners of the other nine principal prizes were:

Second price, $3,500—Miss Grace Hampson, Edgewood, R. I.
Third prize, $2,000—Miss Grace Morris Price, Pittsburgh, Pa.
Fourth prize, $1,000—The Rev. Warren C. Taylor, Albion, N. Y.
Fifth prize, $500—Miss F. Fern Ferneau, Ft. Wayne, Ind.
Sixth prize, $400—Mrs. Chris Mason Bradley, San Francisco, Calif.
Seventh Price, $350—Mrs. Frederick H. Kranz, Buffalo, N. Y.
Eighth prize, $300—Mrs. Rose Fine Young, Sherman, Texas.
Ninth prize, $250—Miss Ethel M. Arnold, Manhattan, Kan.
Tenth prize, $200—Charles Paget Golding, Cambridge, Mass.

Central Arizona Co. Given New 25-Year Franchise

By a ratio of three to one, voters of Phoenix, Ariz., have approved the granting of a new 25-year franchise to the Central Arizona Light & Power Company. The new franchise will replace the present 50-year franchise under which the company is operating and which still has six years to run.

Provisions of the new franchise are the same as those of the old one, except that the new one provides that the company shall pay, in lieu of all other franchise or occupational taxes, a revenue of 2 cents per $100 of gross earnings to the city, this amount not to fall below $500 per year.

Genealogy of ELECTRICAL WEST

IN 1887 there was founded in San Francisco *Pacific Lumberman, Contractor and Electrician,* the electrical department of which was edited by George P. Low. As electrical development in California progressed it was deemed advisable to divorce the electrical department from the parent publication. This was done in July, 1895, and the new paper was called *Electrical Journal,* with Mr. Low as editor and publisher. To avoid confusion with *Electrical Journal* founded at about this time by the Westinghouse Company in Pittsburgh, Pa., the name of the Pacific Coast paper was changed in September, 1895, to *Journal of Electricity.* The paper was brought out as a monthly under this title until July, 1899, when the name was changed to *Journal of Electricity, Power and Gas.* After the San Francisco fire of April, 1906, the Technical Publishing Company was organized and publication was changed to weekly and continued so to January, 1917, when the schedule was changed to semi-monthly publication. On Jan. 1, 1919, the name was again changed, the paper reverting to the title *Journal of Electricity.* In September, 1919, the paper was purchased from the Technical Publishing Company by the McGraw-Hill Company. On Feb. 1, 1921, the McGraw-Hill Company of California was organized and the name of the paper changed to *Journal of Electricity and Western Industry.* It was found advisable to revert to the title, *Journal of Electricity,* on July 1, 1923. On Jan. 1, 1927, the paper became ELECTRICAL WEST with a monthly publication schedule. The magazine has always been published in San Francisco.

Editorial policies of the paper, first as a department in *Pacific Lumberman, Contractor and Electrician,* and later as *Journal of Electricity,* were directed by George P. Low as editor until early in 1905. He was succeeded by C. L. Cory, dean of the College of Mechanics of the University of California, who held the position of editor until 1907. From 1907 until 1911 the paper was directed by A. H. Halloran as managing editor. In 1911 Robert Sibley became editor, a post he held until Aug. 1, 1922, when he was made editorial director. Since Jan. 1, 1923, C. T. Hutchinson has been editorial director and G. C. Tenney managing editor. In addition the present staff consists of W. A. Cyr, associate editor, G. Ross Henninger, associate editor, D. D. Peede, news editor, and B. H. Snow, Northwest editor.

Electricity's Use on Farm Stressed in U.C. Course

Approximately 50 power salesmen and rural service men of California power companies were given instruction in the principles underlying the application of electrical energy to farming at the second annual rural electric short course at the branch of the College of Agriculture of the University of California at Davis, Dec. 9-12, 1929.

The staff of lecturers and instructors included members of the faculty of the College of Agriculture as well as experts of the Agricultural Extension Service. Among the subjects covered were electrically operated feeders and grinders, various phases of irrigation, farm building wiring, electricity in the poultry industry and in dairying. One of the features of this year's course consisted of laboratory periods in which those in attendance at the school operated and studied various types of feed grinders and actually tested pumps under field conditions.

Los Angeles Water & Power Bureaus to Be Restored

The Los Angeles Board of Water and Power Commissioners has reorganized the Los Angeles Department of Water and Power and has set up two separate bureaus, one to be known as the Bureau of Power and Light and the other to be designated The Bureau of Water Works and Supply.

This, in effect, has re-established the municipal bureaus as they were nine months ago. At that time H. A. Van Norman was made general manager of the combined departments. Carl Heinze was made assistant general manager under Mr. Van Norman, and J. Hunter Clark was appointed executive assistant to Mr. Van Norman. Both the position held by Mr. Heinze and the position held by Mr. Clark have been abolished under the present plan. In the resolution, which was introduced by Commissioner H. G. Palmer, the reason for the change was stated as the imperative necessity that the Water Bureau shall have at this critical time the entire thought, energy and time of a manager.

Under the new plan H. A. Van Norman will be general manager and chief engineer of the Bureau of Water Works and Supply. E. F. Scattergood is to be general manager and chief engineer of the Bureau of Power and Light.

In Mr. Scattergood's department will be H. C. Gardett, engineer of electrical design and construction, and C. P. Garman, has assistant; T. A. Panter, engineer of electrical operation, and Roy Martindale, assistant. In Mr. Van Norman's department are W. W. Hurlbut, engineer of water distribution and operation; J. E. Phillips, engineer in charge of the Owens River Aqueduct; and F. E. Weymouth, engineer of design and construction.

McGraw-Hill Co. Opens Offices in Los Angeles

Pacific Southwest offices of the McGraw-Hill Company of California have been established at 632 Chamber of Commerce Building, Los Angeles, for the purpose of maintaining closer contact with southern California and Arizona. The new offices will serve as headquarters for H. C. Rowell, district manager, and Roy N. Phelan, assistant manager, who will represent all of the McGraw-Hill publications in a sales capacity in that territory.

In addition, Charles F. McReynolds, Pacific Coast editor of *Aviation,* and F. R. Schalk, field superintendent of the Pacific Coast division of the McGraw-Hill circulation department, will make this new office their headquarters.

FINANCIAL NEWS

P. G. and E. Co. Sets 1930 Budget at $40,000,000

A budget of $40,000,000 for 1930 has been set up by the Pacific Gas and Electric Company, San Francisco. Of this amount $35,000,000 will be expended on construction of new gas and electric projects, and $5,000,000 on normal expenses and improvements throughout its system, according to announcement of A. F. Hockenbeamer, president.

In the electrical field, $16,000,000 will be required for the Mokelumne River development scheduled for completion in 1931, which will add 228,000 hp. to the company's electric power supply. This $16,000,000 will be alloted as follows: To the Salt Springs dam $4,000,000; to the Tiger Creek power house, including a 20-mile concrete canal from the dam to the plant, $7,000,000; the year's work on the construction of the Mokelumne-Newark transmission line, $3,000,000; and enlarging the Newark substation, $1,786,000.

On the reconstruction of Station "A," the San Francisco steam plant, $4,000,000 will be spent, and $600,000 will be expended in enlarging the Bear River and Wise canals in Placer County to increase generating capacity of the Halsey and Wise power houses near Auburn.

The budget for new buildings contains an item of $1,000,000 for the San Francisco service group, which will occupy the block bounded by Folsom, Shotwell, Eighteenth and Nineteenth Sts., and will include a 300-car garage, shops and warehouses.

The completion of the company's natural gas system calls for the expenditure of $12,000,000, and in addition the company will spend $3,000,000 on additions to its present gas system.

Report Shows $50,000,000 Development for B. C. Co.

The annual report of the British Columbia Power Corporation, issued recently, presages an expenditure of $50,000,000 on power development within the next six years. The corporation is the financial controlling company of the British Columbia Electric Railway Company which, with its subsidiaries, earned a return of 5.61 per cent on cash invested.

The $50,000,000 will be spent largely on development of Bridge River, Ruskin and Campbell River hydro-electric projects. The total capacity of Bridge River is estimated in the report as 750,000 hp. Development of the tunnel connecting Bridge River with Seton Lake is proceeding steadily, being 70 per cent completed, the report states.

In the Ruskin development the ultimate capacity is reckoned at 188,000 hp. and will cost $20,000,000. About 47,000 hp. will be brought into service in about a year.

Power and light customers now number 105,908, as compared with 84,587 last year. Gas consumers have grown from 29,000 to 45,163 during the same period.

Pepco Construction Budget Doubled for 1930

The Portland Electric Power Company will spend $4,300,000 in 1930 on new construction in the light and power department, according to Franklin T. Griffith, president. This is more than double the 1929 construction expenditures and amounts to about $40 per customer.

The largest item is for increase and betterment of generating facilities, $2,601,750, which covers the installation of a new 35,000-kw. steam turbine at Station L, and an additional waterwheel and generator of 25,500-kw. capacity at the Oak Grove hydro-electric plant. The foundations for the new hydro unit were completed in 1929, and during 1930 the power house will be enlarged and the additional turbine and generator will be installed. This is the second step in the development of this site which originally contemplated three successive steps.

Important transmission improvements scheduled for 1930 are a new steel-tower, 60-kv. line from the River Mill hydro plant at Estacada about twelve miles to Beaver Creek, a central point on the transmission system, and an increase from 33 kv. to 60 kv. on the line from Portland to St. Helens. The increase on the Portland-St. Helens line is made necessary principally by the 4,000-hp. demand of the new Fir-Tex Insulating Board Company's plant, now under construction at St. Helens. The total budget item for transmission is $238,350.

Substation improvements, costing $240,531, will include at Station E steam plant the installation of two 3,667-kw., three-phase, water-cooled transformers to step the voltage up from 11 kv. to 60 kv. to supply the St. Helens line which takes off from this point. These transformers will be fed direct from the company's main steam plant, Station L, by two 400,000-circ. mil, 11-kv., three-phase cables laid underground and for a portion of the distance under the Willamette River. This underground and submarine installation is one of the major items in the distribution item of the budget, which totals $1,225,350.

Colorado Utility Budgets $1,500,000 for 1930

The Southern Colorado Power Company, Pueblo, Colo., has announced a construction and expansion program that will require the expenditure of approximately $1,500,000 during 1930.

Increased demands for power throughout the Arkansas Valley and at Cripple Creek where mining operations have revived, are given by company officials as the incentive for the usual budget.

Capacity of the company's central plant at Pueblo will be considerably increased and additional facilities for generating power will be provided, it was stated. Similar stations at Canon City and Cripple Creek are to be enlarged.

In the Arkansas Valley the capacity of substations at Rocky Ford, La Junta and Fowler are to be expanded. Capacity of transmission lines throughout the valley section will be considerably augmented to carry the extra load.

EXTENSION OF TIME GRANTED CALIFORNIA COMPANIES FOR STOCK SALE—The California Railroad Commission has granted to the Great Western Power Company of California an extension of time to Dec. 31, 1930, within which to issue and sell the $10,000,000 of 4½ per cent gold notes, previously authorized by the commission. The commission also has granted an extension of time to the same date to the Los Angeles Gas and Electric Corporation within which to issue and sell 50,000 shares of preferred stock, authorized on Jan. 30, 1925.

SEATTLE CITY LIGHT BONDS OFFERED—A new issue of $2,000,000 City of Seattle Municipal Light and Power Plant and System 5 per cent gold bonds is being offered. The bonds, which mature $80,000 annually from Oct. 1, 1935, to 1959, inclusive, are dated Oct. 1, 1929, and are priced at $100 and interest to yield 5 per cent. The bonds are issued by the city for the purpose of making additions to the existing system and are payable from city light revenues. The Bancamerica-Blair Corporation, B. J. Van Inge & Company, and Eldredge & Company are offering the bonds.

P. G. AND E. CO. SEEKS PERMIT TO PURCHASE NOVATO (CALIF.) UTILITY—The Pacific Gas and Electric Company, San Francisco, has applied to the California Railroad Commission for authority to purchase and operate the electric properties of the Novato Utilities Company, operating in the town of Novato and vicinity, Marin County. The applicant proposes to pay the sum of $100,000, and to assume $23,000 of outstanding notes of the Novato company.

Three Transportation Section Divisions Report at San Diego Meeting

THE hearing of reports of committee chairmen in the accounting, maintenance and technical divisions, and resulting discussion thereon, formed the major business of the second meeting of the Transportation Section, P.C.E.A., held Dec. 5-6 at the San Diego Consolidated Gas & Electric Company Building, San Diego, Calif. The meeting was presided over by C. D. Weiss, chairman of the section.

Discussion following a paper presented by H. D. Tisdale, chairman of the costs committee of the accounting division, on "The Practicability of Cost Accounting for Operating and Maintaining Automotive Equipment" led to the conclusion that the majority of statistical cost data were cumbersome and prepared too late to be of value to transportation operating departments.

R. V. Dodge, Jr., representing the committee on appearances of the maintenance division covered the subject of appearances, involving all branches of the public utility industry, in a paper entitled, "Aesthetics in Motor Vehicles as a Business Aid." Discussion pointed to methods of securing co-operation from departments using motor vehicles.

"Reclaimed Oil" was the subject of a paper presented by E. M. Rondot, chairman of the material committee of the maintenance division. Discussion following a report of the repairs committee of that division definitely established that company-owned shops give better control and continuity of service to physical departments than is provided by commercial shops, although it was admitted that large repairs and special repairs requiring elaborate and expensive tools can be accomplished more economically by commercial shops.

Recommendations were made in a discussion following a paper on "Power Devices" presented by E. C. Wood, chairman of the technical division, that a manual treating the subject of power devices he prepared in which would be given the names of manufacturers and dealers of the devices used.

Members of the section present endorsed the formation of a separate Motor Transportation Section of the National Electric Light Association, instead of the formation of a truck operating subcommittee now under consideration by several Eastern divisions.

The next meeting of the Transportation Section will be held in the garage office of the Southern California Edison Company, 650 South Ave. 21, Los Angeles, Feb. 13-14, 1930.

Members of the Transportation Section, P.C.E.A., who attended a two-day session in San Diego, Dec. 5-6. *Left to right:* L. A. Savage, general garage foreman; W. E. Frazier, F. W. Keller, San Diego Consolidated Gas & Electric Company; D. P. Mason, manager supplies division, Great Western Power Company, San Francisco; H. D. Tisdale, transportation auditor, Southern California Edison Company, Los Angeles; G. D. Brown, San Diego Consolidated Gas & Electric Company; W. J. Schaeffer, superintendent of transportation, Los Angeles Gas and Electric Corporation; J. S. Bordwell, assistant auditor, Southern Sierras Power Company, Riverside, Calif.; R. V. Dodge, Jr., F. M. Sherrill, San Diego Consolidated Gas & Electric Company; P. H. Ducker, superintendent of transportation, E. M. Rondot, assistant superintendent of transportation, Southern California Edison Company, Los Angeles; C. H. Gray, garage manager, The Southern Sierras Power Company, Riverside; E. P. Smith, assistant general manager, San Joaquin Light and Power Corporation, Fresno; C. D. Weiss, superintendent of transportation, San Diego Consolidated Gas & Electric Company, chairman of the Transportation Section. E. C. Wood, superintendent of transportation, Pacific Gas and Electric Company, San Francisco, and Col. W. H. Fairbanks, general motor supervisor, Southern California Telephone Company, Los Angeles, were both present at the sessions, but not included in the picture.

Engineering Section to Meet in Los Angeles Jan. 15-17

The Engineering Section, P.C.E.A., will hold its second group meeting at the Los Angeles Gas and Electric Corporation Building, Los Angeles, Jan. 15-17. The schedule of committee meetings is as follows:

Wednesday, Jan. 15—Accident Prevention, Hydraulic Power, Overhead Systems: 10 a.m.-2 p.m.

Thursday, Jan. 16—Electric Apparatus, Inductive Co-Ordination: 9:30 a.m.-2 p.m.

Friday, Jan. 17—Meters, Prime Movers, Underground Systems: 9:30 a.m.-2 p.m.

The executive committee and committee chairmen will hold a dinner meeting at 6 p.m. Thursday, Jan. 16, at the Jonathan Club, and a general luncheon meeting will be held at 12:15 p.m. on the same day at the Engineers' Club. E. B. Criddle, president of the P.C.E.A., will be the speaker.

Speakers Named for Second Commercial Conclave

The choice of speakers for the program of the two-day session of the Commercial Section, P.C.E.A., to be held at the Fairmont Hotel, San Francisco, Jan. 9-10, presages a meeting of unusual interest for the second conclave of the section this year. The program follows:

Thursday, January 9

10:30 a.m. General session.
Address—C. E. Greenwood of New York, commercial director, N.E.L.A.

12:15 p.m. Luncheon.
Address—"Taking Electricity's Message Into the Home"—Charles T. Hutchinson, president, McGraw-Hill Company of California, and chairman advisory committee, California Electrical Bureau.

2:00 to 5:30 p.m. Committee meetings.

Friday, January 10

9:30 to 12 Committee meetings.

12:15 p.m. Informal luncheon.

2:00 p.m. General session.
Reports of progress by bureau chairmen.
Address—"Regulation and the Commercial Man"—Leon O. Whitsell, California State Railroad Commission.

ADVERTISING-PUBLICITY SECTION TO MEET JAN. 10-11—A meeting of the Advertising-Publicity Section, P.C.E.A., will be held Jan. 10-11 at the Fairmont Hotel, San Francisco. Members of the section will meet with the Lighting Bureau of the Commercial Section on the morning of the 10th for the discussion of a domestic lighting advertising program, and will hold a joint meeting with the Commercial Section on the afternoon of that day. The morning of the 11th will be given over to a discussion of the national employees' speaking contest.

Northwest Electric Light & Power Association

Utility Employees to Enter National Speaking Contest

Principal activity in the Public Relations Section of the Northwest Electric Light & Power Association during the current year is to center around the N.E.L.A. Public Speaking Contest. Two contests are to be held, one for men and one for women. Winners of the company contests are to compete in the finals of the association contest on May 17 in Portland, and the winning man and woman will then compete against each other for the honor of representing the Northwest Geographic Division in the finals of the national contest at San Francisco in June.

The first prize in the Northwest Geographic Division for both contests is a trip to the national convention at San Francisco. Runners-up in each contest will receive $25.

Rules and regulations governing participation in and judging of the Northwest contest are identical with those of the national contest.

The advertising-publicity committee of the Public Relations Section has decided to devote its efforts during the current year to giving publicity in the member companies to the public speaking contest. Further, the committee will attempt to exploit the Northwest territory in connection with the N.E.L.A. convention by attempting to route as many Eastern delegates as possible to or from San Francisco through the Northwest.

Expanded Section Meetings Take Place of Convention

Plans for sectional conferences to be held during February and March by the Accounting, Commercial and Engineering Sections of the Northwest Electric Light & Power Association have been perfected at recent meetings of the executive committees of those sections. Indications are that these meetings will be larger and better than ever before due in part to the fact that no general convention is to be held by the association in 1930.

First in point of time will be the annual mid-winter meeting of the Commercial Section, to be held at Spokane, Feb. 13-15. As at last year's meeting, two and one-half days will be occupied by the business sessions with the meeting ending at noon on Saturday, Feb. 15. Reports either final or on progress will be made by all committees and special subjects pertinent to commercial activity will be discussed by speakers outside the Commercial Section. A special effort is to be made to secure the attendance of company executives at this very important conference which is expected to develop many profitable load-building ideas.

The Accounting Section's mid-winter conference is to be held in Portland, March 17-18. The program of this meeting will be considerably more expansive than those of former Accounting Section conferences and will be spread over two days instead of one as formerly. Besides discussions of matters now under consideration by the various committees, added interest in the broader aspects of accounting work will be introduced into the meeting by outside speakers.

Following its experiment last year in holding the general meeting in one of the smaller towns in the territory, the Engineering Section has chosen Aberdeen, Wash., as its meeting place for 1930. While the dates have not been definitely set, three days out of the week of March 23 will probably be chosen. The usual interesting program of prepared papers and extemporaneous discussions on pertinent engineering subjects may be expected at this, the seventh annual general meeting of the section.

Meetings

Coming Events

American Institute of Electrical Engineers, Pacific Coast Division—Annual convention, Portland, Sept. 2-5, 1930.

National Electrical Wholesalers Association, Pacific Division—Annual convention, Hotel Del Monte, Del Monte, Calif., Jan. 31-Feb. 1, 1930.

National Electric Light Association—Fifty-third convention, San Francisco, June 16-20, 1930.

Pacific Coast Electrical Association—Joint convention with National Electric Light Association, San Francisco, June 16-20, 1930.

Advertising-Publicity Section meeting, Hotel Fairmont, San Francisco, Jan. 10-11, 1930.

Commercial Section meeting, Hotel Fairmont, San Francisco, Jan. 9-10, 1930.

Engineering Section meeting, Los Angeles Gas and Electric Corporation Building, Los Angeles, Jan. 15-17, 1930.

Transportation Section meeting, Southern California Edison Company garage office, 650 South Ave. 21, Los Angeles, Feb. 13-14, 1930.

Electrical League of Utah Elects Year's Officers

At the annual election of officers of the Electrical League of Utah, held Dec. 9 at its offices in the Newhouse Hotel, Salt Lake City, the following officers were elected for the ensuing year: President—G. W. Forsberg, of the Wasatch Electric Company; vice-president—B. C. J. Wheatlake, of the General Electric Company; secretary and treasurer—M. L. Cummings, Jr., of the Utah Power & Light Company.

Mr. Forsberg succeeds J. M. Perlewitz, of the Graybar Electric Company. Mr. Wheatlake succeeds Mr. Forsberg, and Mr. Cummings is re-elected for a second term. R. E. Folland, who has served in the capacity of executive secretary of the league for several years past, is retained in that position for the coming year.

Members of the board of trustees who will serve for the ensuing year are as follows:

Electrical Jobbers' Branch—C. B. Hawley, Inter-Mountain Electric Company; W. J. Berryman, Mine & Smelter Supply Company; H. S. Bygel, United Electric Supply Company, and J. A. Kahn of the General Electric Supply Company.

Electrical Contractor-Dealers' Branch—G. W. Forsberg, Wasatch Electric Company; C. L. Felt, Felt Electric Supply Company; Blaine Grey, Blaine Grey Electric Company; R. P. Maybee, Maybee & Shipley Electric, Inc.; Manufacturers' Branch—W. A. La Pierre, American Steel & Wire Company; Raymond Ackerman, Benjamin Electric Company; W. A. Moser, Westinghouse Electric & Manufacturing Company; B. C. J. Wheatlake, General Electric Company; Central Station Branch—P. M. Parry, H. M. Ferguson, R. M. Bleak and C. A. Wolfrom, all of the Utah Power & Light Company; Telephone Company—S. J. Jones, Mountain States Telephone & Telegraph Company.

SAN FRANCISCO LEAGUE HOLDS KIDDIES' CHRISTMAS PARTY — Christmas was celebrated appropriately by the San Francisco Electrical Development League both in a party for members and their families and by the provision of clothing and gifts to 102 children, selected by the Salvation Army as badly in need of help. The members' Christmas party was held at the Palace Hotel ballroom on Dec. 16 at noon, and was in charge of Ernest Ingold. A program of entertainment particularly arranged for children, with clowns, magicians, ventriloquists and musicians, and Santa Claus, in the person of Henry Bosch, aided by Walter C. Heston and P. A. Anderson, as gnomes, made the event eminently successful. At the Salvation Army Christmas party for the poor children a similar program of entertainment had been arranged by the Army. President Don C. Ray, of the San Francisco Electrical Development League, made a short talk. The directors of the League attended on behalf of the membership. Fine moneys collected during the year in weekly meetings make up a charity fund for this work each Christmas in conjunction with the Salvation Army.

Personals

Chas. Grunsky Resigns from State Railroad Commission

CHARLES GRUNSKY, gas and electric engineer of the California Railroad Commission, has resigned from the commission to accept a position as supervising engineer with the management and engineering company which is now being organized to direct the activities of The Pacific Public Service Corporation, its subsidiaries and allied companies. Mr. Grunsky entered the employ of the Railroad Commission in 1914 as assistant engineer. He spent his time on valuation work in 1914 and

CHARLES GRUNSKY

1915, on gas and electric work in 1916, and was in charge of the gas laboratory of the commission in 1917. After two years' service overseas in command of Engineer Train and Company B, Fifth Engineers, he returned to the employ of the Railroad Commission in 1919 as assistant engineer engaged in rate and valuation work. He was appointed gas and electric engineer, in charge of that division of the commission's engineering department, in the latter part of 1926.

Among the more important features of his work with the commission were appraisals made of the Key Route and Oakland Traction Company in 1914 and 1920; appraisals of the Los Angeles properties of the Southern California Edison Company in 1915, and the entire system of that company in 1920; valuation of the Pacific Gas and Electric Company's electric system in 1921-22, the gas and electric properties of the Western States Gas & Electric Company in 1922, the entire electric system of the San Joaquin Light & Power Corporation in 1921, and of the systems of The Southern Sierras Power Company, Nevada California Power Company, and numerous other smaller companies.

Mr. Grunsky is succeeded as gas and electric engineer of the Railroad Commission by Claude C. Brown, who has been natural gas administrator for California since July, 1927.

E C. Hutchinson Appointed Editor of "Power"

ELY C. HUTCHINSON, well known to the electrical industry of the West through his association for 21 years with the Pelton Water Wheel Company, of San Francisco, has been appointed editor of *Power*, a McGraw-

ELY C. HUTCHINSON

Hill weekly journal published in New York.

Mr. Hutchinson's ripe experience in the engineering profession and industry fits him well for his present post. Beginning as a pattern maker's apprentice, he worked successively as draftsman and then as designer of engines, hoists, compressors and mining machinery. Subsequently he engaged in the selling of engineering products and was variously employed as engineering salesman, manager of sales and chief engineer of corporations in the field served by *Power*. In 1922 he was appointed president and general manager of the Pelton Water Wheel Company.

Mr. Hutchinson's professional and social activities in the field of mechanical engineering have also been varied. In the American Society of Mechanical Engineers he was one of the organizers of the hydraulic division, was its chairman for the first two years and is now a member of its executive committee. Mr. Hutchinson is the inventor and patentee of numerous mechanical devices in hydraulic engineering and has contributed to engineering literature on economic and technical subjects.

As editor of *Power* Mr. Hutchinson succeeds Fred R. Low, who has served as editor of the paper for more than 40 years and who, because of his advanced age, will continue his association with the magazine as a contributing editor only.

J. F. Pollard Accepts New Post In Seattle

JAMES F. POLLARD, manager of the Coast Valleys Division of the Pacific Gas and Electric Company, with headquarters at Salinas, Calif., has resigned from that company and is leaving California for Seattle to take up on Jan. 15 the duties of general manager of the Seattle Lighting Corporation, newly acquired subsidiary of the Central Public Service Corporation, as successor to F. K. Lane.

During the seven years that he was in charge of the operations of the Coast Valleys Gas & Electric Company and for the two years since that company was acquired by the Pacific Gas and Electric Company, Mr. Pollard has distinguished himself as an executive of rare ability. He is long experienced in public utility work. Upon graduation from the University of California in 1912 with the degree of Bachelor of Engineering he joined the engineering department of the Pacific Gas and Electric Company and from then until 1915 he spent some time on the Drum development of that company. In the latter year he became assistant engineer of the California Railroad Commission, and in 1918 was appointed

JAMES F. POLLLARD

commercial manager of the Sierra and San Francisco Power Company and the Coast Valleys Gas & Electric Company, and assistant to Capt. H. F. Jackson, who then was president of both companies. In 1920 he was appointed vice-president in charge of operations of the Coast Valleys company, and when the H. M. Byllesby Engineering Company, of Chicago, acquired control of the company, Mr. Pollard was made vice-president and general manager by Mr. Byllesby.

Mr. Pollard for several years has been active in the work of the Pacific Coast Electrical Association, and last year served as chairman of the Commercial Section. He is still a member of the executive committee of that section and is also a member of the Advertising-Publicity Section.

ROY R. COWLES, since 1921 assistant engineer in the Pacific Gas and Electric Company's department of distribution and steam engineering, has been transferred to the company's department of electrical construction and operation under F. R. George. Prior to 1921 Mr. Cowles was superintendent of the underground department in the East Bay Division of the same company.

E. O. Shreve Is Advanced by General Electric Co.

E. O. ("Bill") SHREVE, who is well known to the electrical fraternity in the West through his many years of service as district manager in San Francisco for the General Electric Company, and who for the past three years and a half has been manager of the company's industrial department at Schenectady, N. Y., has been appointed assistant vice-president of the General Electric Company on the staff of J. G. Barry, vice-president in charge of sales.

Mr. Shreve has been in the employ of the General Electric Company since his graduation from the Iowa State College in 1904. He was sent to San Francisco as a supply salesman in 1905 and rose through various steps to managership of that office in 1917.

During the years that he spent on the Pacific Coast Mr. Shreve was always a leader in any movement that contributed to the welfare of the electrical industry in this territory. He was an active worker on committees of the P.C.E.A., and was a member of the general convention committee and chairman of the finance committee for the N.E.L.A. convention held in San Francisco in 1925. Mr. Shreve is a past president of the San Francisco Electrical Development League, and was one of the founders of the California Electrical Bureau.

Obituary

Veteran Engineer Dies in Los Angeles

R. F. LEEFELD, superintendent of electrical generation for the Los Angeles Gas and Electric Corporation, Los Angeles, died in that city Dec. 9.

A native of Wisconsin, Mr. Leefeld came to California as a young man and at one time was employed by one of the electric railway companies in Los Angeles. From 1909 to 1916 he was chief engineer for the Temescal Water Company at Corona, Calif. For the two years following this he was associated with the Corona Foothill Lemon Company as a Diesel engineer, and from June, 1918, to September, 1919, he was in the employ of The Southern Sierras Power Company. During the next two years he served the Arizona Power Company as chief engineer at Clarksdale, Ariz., and then on Aug. 29, 1921, he joined the Los Angeles Gas and Electric Corporation, taking the position he held at the time of his passing. Mr. Leefeld's development and improvement in gas burner design are in large part responsible for the splendid efficiency record maintained by the Seal Beach steam plant of that company.

"Wally" Briggs (with the glasses) celebrating his last birthday with the "kids" of the Electric Park Club

Wallace W. Briggs Succumbs to Long Illness

WALLACE W. BRIGGS, since 1925 vice-president and general manager of the Grays Harbor Railway & Light Company, Aberdeen, Wash., died in that city Dec. 9. While Mr. Briggs had long been a sufferer from an infection of the lungs, his death was sudden and unexpected in view of his recent apparent good health and was preceded by an immediate illness of only two days.

From the time that he joined the Westinghouse Electric & Manufacturing Company as district manager in San Francisco in 1899, Mr. Briggs made himself well known to the electrical fraternity in the West. In 1913 he took over the management of the Great Western Power Company of California, leaving in 1918 to rejoin the Westinghouse organization in the East. Subsequently he became affiliated with the Federal Light & Traction Company, which controls the Grays Harbor company, and was sent to Aberdeen. At the time of his death he was a member of the executive committee of the Northwest Electric Light and Power Association.

A genial, kindly man, Mr. Briggs was "Wally" to all who knew him. He was responsible for the construction of a free outdoor swimming pool at Electric Park where Grays Harbor children frolic each season under the supervision of a competent matron and swimming instructress. The "Old Swimming Hole," as it is known, was opened in 1927 by a huge birthday party at which every youngster was given all the ice cream he could eat. "Wally Briggs' Kids' Party" became an annual affair, and last July he was host to some 6,000 of his "kids." He organized the Electric Park Club, composed of boys and girls making regular use of the pool, as a means of fostering a spirit of fair play among his "kids." There are now more than 1,500 members and a waiting list of youngsters eager to join.

H. H. NOBLE, a pioneer in the California hydro-electric development field, died in San Francisco Dec. 19, at the age of 85. In 1900 he organized the Keswick Electrical Power Company in Shasta County, which was one of the first attempts to generate electricity from California waters. Later he was joined by Eugene de Sabla and John Martin, and out of this association grew the Northern California Power Company, which eventually was consolidated with the Pacific Gas and Electric Company.

CHARLES RUMMEL, for the past fourteen years manager of the light and power department for the British Columbia Electric Railway Company, in the entire Fraser Valley area, died recently in Burnaby, B. C., at the age of 61. Mr. Rummel joined the organization of the predecessor of the present British Columbia Electric Railway Company as a clerk in 1892 at a time when the entire office staff including himself numbered three.

WILLIAM F. DETERT, at one time president of the Northern California Power Company, which later became part of the Pacific Gas and Electric Company, died in San Francisco Dec. 13, at the age of 79. He had been identified with mining for many years in California.

Contractors, Dealers and Inspectors

Contract Clauses to Protect Contractor

Everybody is protected except the contractor, it seems, in the building game. For some time past the Association of Electragists International has been working on a set of standard clauses for proposals which, if incorporated in the contract, would give adequate protection to the electrical contractor.

At the last convention of the A.E.I. at Swampscott, Mass., the following standard clauses were adopted by the convention:

This proposal when accepted shall include any of the following stipulations not embodied in the contract form submitted.

1. Unit prices submitted with this proposal shall apply only for additional work.
2. No pro-rata or other charges shall be assessed against the contractor unless it is so stated in the original specifications.
3. The contractor has the privilege of using any make of material or equipment as indicated in the specifications or shown on the plans unless the selection of the material shall have been made prior to the signing of the contract.
4. Overtime work is not contemplated and shall not be required as a part of this contract. If it is necessary to work overtime, the expense for such overtime shall be paid the contractor, plus overhead and profit, and shall be agreed upon before the contractor is required to proceed.
5. The contractor shall request written orders for all additional work whether it be on a contract price, unit price, or time and material basis, before proceeding with such extra work.
6. Payments for additional contracts to the original contract shall be made under the same terms and conditions as are embodied in the original contract.
7. Payments shall not be withheld on this project because of any delays caused by other trades over which the contractor has no control.
8. The contractor shall not be required to proceed with the installation of the work if the payments applying on same have not been made as specified in the contract.
9. Any controversy or claim arising out of or relating to this contract or the breach thereof, shall be settled by arbitration, in accordance with the rules, then obtaining, of the American Arbitration Association, and judgment upon the award rendered may be entered in the highest court of the forum, state or federal, having jurisdiction.

Four Presidents of the Northwest Section

Left to right, H. F. Jenkins, Bellingham, Wash., second president of the I.A.E.I.; C. H. Fletcher, Vancouver, B. C., the fourth and newly elected president; H. A. Patton, Seattle, third and retired president; and L. W. Going, Portland, the first president

Inspector Helps Red Seal by Report

Excellent co-operation in Red Seal work is given the Electrical Service League of British Columbia by Charles Fletcher, city electrical inspector, Vancouver, B. C.

The electrical league furnishes a memo form on which the name, address, number of light outlets, base plugs, switches, whether range, water heater or electric heating or radio are to be installed and the name of the electrical contractor is made out and turned over to the league from the day's permits. From this list the league is able to follow up any residential installations which look as though they might be candidates for a good Red Seal job.

Electrical Service League of B.C.

MEMO RE PERMITS

Date_____

Name_____

Address_____

No. of Light Outlets_____

No. of Base Plugs_____

No. of Switches_____

Range_____

Water Heater_____

Electric Fires_____

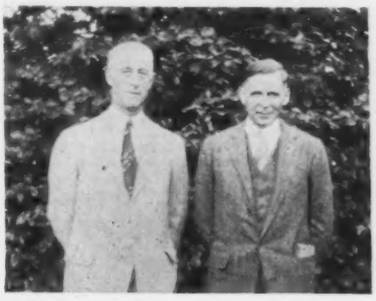
Radio_____

Electrical Contractor_____

The form filled out on each residential permit.

This co-operation has helped materially to place Vancouver so high in the list of Red Seal homes wired during the recent year, according to John Hart, manager of the league.

Underwriters and Utilities



Underwriters' Laboratories and power companies were represented effectively by Dana Pierce, president, Underwriters' Laboratories, Chicago, and H. F. Bennion, head of the engineering division, N.E.L.A.

THE GENERAL ILLUMINATING COMPANY, INC., Seattle, which constructs electrical advertising and lighting displays, has established offices at 1912 Third Ave., with James R. Lunke in charge.

FRANK STEEL, of Steel & Phelps, electrical and plumbing engineers and contractors of Seattle, was recently awarded the contract for the first unit of the new St. Marks Cathedral in Seattle. Atkins & Parkinson, San Francisco architects and engineers, laid out the building. Especially notable is the installation of 1½-in. conduit for loud speaker and radio circuits, providing capacity for future use of such equipment greatly ahead of the times.

C. C. CARTER, electrical contractor, Vancouver, B. C., recently finished up an installation at the Canadian Linen Company which involved special control apparatus. A special control panel to handle the various operations of the washers made an interesting job. Revolving contacts, so arranged that the load is distributed and does not come on the line all at one time in reversing and stopping, are mounted on this panel. Five large ventilating fans and a good job of lighting with R.L.M. dome reflectors and individual pull chain control were also features of the job.

RATNER ELECTRIC COMPANY, of San Diego, recently completed the wiring of a new home for H. H. Jones at La Playa, San Diego. Mr. Jones was formerly manager of the San Diego Consolidated Gas & Electric Company and later vice-president of the Northern States Power Company at Minneapolis, and more recently general manager of the former Western States Gas & Electric Company at Stockton. He has now retired and is living in San Diego.

Inspecting the Green

F. T. Weber, of the Oregon Insurance Rating Bureau, and secretary of the Northwest section, I.A.E.I.; A. M. McLean, electrical inspector; and L. W. Going, chief electrical inspector, Portland, on one of Vancouver's fairways

California Electragist Leaders Who Face Important Problems of Chapter Reorganization

GLENN ARBOGAST

GLENN E. ARBOGAST, president and general manager of the Newbery Electric Corporation, Los Angeles, Calif., is the new leader of the California Electragists, having been recently elected state president and chairman of the Southern Chapter.

A native of Iowa, Mr. Arbogast early followed a well known practice of natives of that state and went to Los Angeles, where for the seven years from 1903 to 1910, he served as superintendent of construction for the F. E. Newbery Electric Company. For the next five years he was general manager of the Newbery-Bendheim Electric Company, and then in 1915 he was made general manager of the F. E. Newbery Electric Company, a position he held until 1921 when he was made president and director of the Newbery Electric Corporation, electrical contractors, engineers and dealers.

Mr. Arbogast is also a director of the Crystalite Products Corporation, Glendale, and the Permoid Process Company, Los Angeles, as well as president and director of the Interstate Securities Corporation of Los Angeles. He recently was elected president of the Eagle Rock Chamber of Commerce for the third time. Mr. Arbogast always has taken an active part in the affairs of the electrical industry and for many years was president of the Electrical Contractor-Dealers Association, which under reorganization became the Los Angeles Section of the California Electragists. He is also serving as a member of the advisory committee of the California Electrical Bureau.

WALTER VANCE

WALTER D. VANCE, the newly elected vice-president of the California Electragists and chairman of the Northern Chapter, though a native of Ohio may be regarded as a Far Westerner for all but the first 19 years of his life have been spent in the West. After having been graduated from the University of Colorado in electrical engineering in 1904, he joined the Pacific Electric Railway Company in Los Angeles, and remained there two years. Then he became associated with the Oakland Gas, Light & Heat Company, in Oakland, Calif., where he remained until the latter part of 1907 when he organized the Bay Cities Electric Company. Having disposed of his holdings in that company in 1912, for the next three years he managed the Oakland branch of the Rauch & Lang Electric Automobile Company. In 1916 he organized the Magnetic Motor Company, and then in 1918 he purchased an interest in the Pacific Electric Motor Company, with which he is still associated. Since Mr. Vance has been affiliated with the Pacific Electric Motor Company the business has grown from a small electrical store to the present organization with an investment of approximately $100,000 and employing about 50 employees.

UNDER THE NAME OF THE CALIFORNIA ELECTRIC COMPANY, C. D. Bronson and J. C. Morrello, of Oakland, recently consolidated. Mr. Morrello was proprietor of the Slater Electric Company, which he took over several years ago. Mr. Bronson was proprietor of the California Electric Company, then located at 275 Twelfth St. The new establishment is located at 579 Eighteenth St., Oakland.

G. F. CUNNINGHAM, electrical contractor of San Diego, recently wired the big home at La Jolla, Calif., of Ed. Chrysler, of automobile fame. The home is of sixteen rooms, two stories, and is equipped with all electrical conveniences, including range, refrigerator and radio.

FRED EDWARDS, proprietor of the Independent Electric Company, of San Diego, will have his store embellished with a new front and new display facilities before Christmas, according to his plans. He has been doing good business in the washer and ironer field and in radio. Wiring is done only on the time and material basis. Such work is done mostly for old customers and established business.

Looking Them Over

Jim Morrello, of the California Electric Company, Oakland, and Fred Church, field secretary of the California Electragists, northern division, watching preparations for the floodlighting of the hotel at the Bakersfield convention

THE CHRIS SIGN COMPANY, said to be the oldest electrical and commercial sign-building firm in Seattle, Wash., has been purchased by H. A. Selle, and the company in future will be known as the Chris Sign Company, Inc., with headquarters at 613 Third Ave.

C. DIETRICH, proprietor of the Dietrich Electric Company at Escondido, Calif,. entertained on a program given the San Diego Electric Club by Percy Fisher, the Escondido district manager of the San Diego Consolidated Gas & Electric Company, recently.

ORANGE BELT ELECTRIC COMPANY, Porterville, Calif., has been organized to continue the business of the Woods-Watkins Electric Company at 146 North Main St. The principals of the new organization are R. E. Woods, F. A. Rounsaville, R. L. Cogburn and M. L. Poundstone. They will do a contracting and appliance and radio sales business.

HUME & RUMBLE, electrical contractors of New Westminster and Vancouver, B. C., have commenced work on a contract for the erection of 25 miles of telephone line from Whytecliff to Britannia. The contract was awarded by the B. C. Telephone Company, and the line will follow the same route as the existing B. C. Electric Company's transmission line. The country to be traversed is very rugged, and it is estimated that over $40,000 will be required to meet the cost of the work.

Manufacturer & Distributor

Bethlehem Corp. Acquires Pacific Coast Steel Co.

Purchase of the Pacific Coast Steel Company and its subsidiary, the Southern California Iron & Steel Company, by the Bethlehem Steel Corporation, has been announced by Eugene V. Grace, president of the Bethlehem Corporation.

Properties of the Pacific Coast Steel Company and the Southern California Iron & Steel Company to be acquired include steel manufacturing plants in South San Francisco, Los Angeles and Seattle. The three plants have steel ingot capacity of 380,000 gross tons a year, producing billets, merchant and reinforcing bars, light structural shapes, transmission towers, universal plates, light rails, tie plates, splice bars, forgings, bolts, nuts and rivets.

The present Pacific Coast Steel Company was organized in 1909, consolidating the Pacific Coast Steel Company, Portland Rolling Mills, and Seattle Steel Company. In 1924 the company acquired control of the Southern California Iron and Steel Company, formerly known as the California Industrial Company.

The properties to be acquired by the Bethlehem corporation will be operated through a separate subsidiary company with headquarters on the Pacific Coast, according to Mr. Grace's announcement. The name of the new company and its officers have not been made public.

Expansion Plans Made by G. E. Refrigerator Distributor

L. H. Bennett, of San Francisco, northern California distributor of General Electric refrigerators, has incorporated under the laws of California as the L. H. Bennett Company, Ltd., for the purpose of expanding his operations during 1930 and 1931. At the same time the H. B. Rector Company, General Electric dealer with stores in San Francisco and Burlingame, has been merged with the L. H. Bennett Company, and the stores of that company will operate in future under the new name.

Two important personnel additions to his company have been announced by Mr. Bennett. F. Morris Rowles, formerly sales manager of the Associated Oil Company, and prior to that vice-president of the Tidewater Oil Company, has joined the Bennett organization as general sales manager. The increasing importance of the commercial sales avtivity in the refrigeration business has resulted in the organization of a separate commercial department of the Bennett company under the sales managership of Harry B. Falkell, who has resigned as manager of the Oakland division of the National Lamp Works to join the Bennett company. Under the reorganization plan, A. M. Harris, who has been connected with the Bennett organization for some time, becomes manager of the operating department, beginning with the first of the year.

The Bennett company will have a personnel of over 300 and will operate direct twelve retail stores in northern California in addition to a greatly enlarged dealer organization.

El Paso Company First in Refrigerator Sales

G. W. MASON, president, chairman of the board, and general manager of the Kelvinator Corporation, Detroit (*right*) presents a gold loving cup to F. J. Gannon, manager, El Paso Electric Company, El Paso, Texas, in recognition of that company's outstanding record on Kelvinator sales for the fiscal year ended Sept. 30, 1929. The El Paso Electric Company had the best sales record of some 1,525 dealers and distributors in the southern area, comprising 26 Southern and Southwestern states.

POMEROY COMPANY MOVES—The J. G. Pomeroy Company, manufacturers' representatives, with branches in Seattle, San Francisco and Los Angeles, has announced the removal of its Los Angeles office to 823 East Third St. Among the manufacturers represented by this company are the McGill Manufacturing Company, Erie Malleable Iron Company and Edwards & Company.

Graybar Co. to Occupy New San Francisco Building

The San Francisco branch of the Graybar Electric Company will move about Feb. 1 to the new Graybar Building on the northwest corner of Ninth and Howard Sts.

The three-story building will have a frontage of 100 ft. on Howard St. and 150 ft. on Ninth St. with the main entrance on Ninth. It will be of slab-type concrete construction and thoroughly fireproof.

Customers' convenience and rapid handling of orders have been given special consideration in every detail of the plans. The city sales department, for example, will have its own entrance on the west side facing Washburn St. Along this side the building will be recessed 13 ft., thus increasing the street width to 48 ft. and providing ample room for the trucks and delivery wagons of customers calling for materials. A short ramp will lead from this loading area directly to the sales counters so that goods can be transferred from counter to truck with the least effort and no delay. The heavy loading platform will also be on the west side of the building. Along this platform will be racks for storing half a trainload of rigid iron conduit. On the north side is a specially leased parking space 75 x 113 ft.

The arrangement and equipment of the interior will carry out the basic plan of rapid service to customers. The most modern methods of sales display and fast handling of inquiries and orders will be used. Tubes and chutes will connect the various departments. Inter-office communication will be by means of dial telephones which will be connected also to the main switchboard for outside calls. A Western Electric loud speaker installation will save much time by making it possible to call any individual anywhere in the building. Orders will be speeded through the house by the "ripple system"—a commercial application of the familiar railroad semaphore and auto traffic systems.

The Graybar Electric Company is the oldest electrical distributing company in the country, and since Jan. 1, 1929, has been owned and operated by its own employees.

The San Francisco house is one of 71 branches and is 60 years old this year. It has been in its present location at 680 Folsom St. for the past 24 years. This building is an old landmark of the neighborhood since it was one of the few which stood through the fire of 1906, and the supplies thus preserved played an important part in helping immediate reconstruction in the burned area.

Officers of the San Francisco branch are: Manager—W. S. Berry; sales manager—A. H. Nicoll; service manager—L. J. Brown; and assistant treasurer—John Bray. E. J. Wallis is Pacific Coast manager.

Pacific Electric Mfg. Corp. Is Adding to Its Plant

The Pacific Electric Manufacturing Corporation, San Francisco, is increasing its plant facilities to the extent of about 35,000 sq.ft. of floor area by the erection of a two-story addition to its present building at 5815 Third St.

The new structure will house the corporation's oil circuit breaker assembly department, now occupying quarters in the general building. A feature of the new building will be the installation of a ten-ton craneway to expedite the handling of heavy parts of assembled circuit breakers.

Space now occupied by the oil circuit breaker assembly department will be utilized by the air break switch assembly department and the general machine shop, to which several large machines are to be added.

Total new capital to be invested in the expansion will be in the neighborhood of $100,000—$75,000 for the new building and fixtures, and $25,000 for additional machinery.

G. E. Buys Resilient Terminals Company — Announcement has been made by F. E. Boyd, vice-president, Resilient Terminals Company, 88 Tenth St., Oakland, Calif., of the purchase of the assets and liabilities of that company by the General Electric Company, Schnectady, N. Y. The Resilient Terminals Company was formed two years ago by J. P. Botelho and W. D. Vance, owners of the Pacific Electric Motor Company, of Oakland, and N. H. Watts, for the manufacture of an unbreakable attachment plug and cord of soft rubber, known as Unicord.

Dressed for the Jubilee

THE building occupied by the General Electric Supply Corporation in Salt Lake City was festive with light during the recent celebration of Light's Golden Jubilee. Show cards in one of the store windows told the history of the incandescent lamp and a large portrait of Mr. Edison occupied the center of a display of Mazda lamps.

Represents the Lincoln Electric Company—A promotion places S. H. Taylor in the position of district representative at Los Angeles of The Lincoln Electric Company, of Cleveland, Ohio. Mr. Taylor's headquarters are at 812 Mateo St.

U.S. Motors Los Angeles Plant Again Enlarged

An addition which will approximately double the capacity of its exasting plant is being erected adjacent to the present building of the U. S. Electrical Manufacturing Company in Los Angeles. The new structure will occupy an area 140 x 150 ft. with a wing 24 x 40 ft. The center bay is designed to accommodate a five-ton double girder crane with smaller cranes to be installed in the lower side bays.

This is the third addition to the U.S. motor plant during the past year. Last spring a one-story wing was added to the east side of the main production building and a spur track laid down, and a new foundry building was completed in the fall. Completion of the recent addition will give the plant a total floor area of more than 100,000 square feet.

Pacific Coast Representative Appointed for Electrochef—Clarke F. Edwards, of Los Angeles, has been appointed Pacific Coast representative for Electro-Master, Inc., Detroit, Mich., manufacturer of the Electrochef, an electric cooking machine. Electro-Master, Inc., was organized Oct. 1, 1929, to take over the manufacturing business developed by a subsidiary of The Detroit Edison Company. Mr. Edwards, who formerly was with the Majestic Electric Appliance Company, of San Francisco, has been placed in charge of all coast activities having to do with the distribution and service of the Electrochef.

Represent Sparklets, Inc., Throughout the Coast—H. J. Gute & Company, San Francisco, Los Angeles and Denver, are now acting as exclusive sales representatives on the Pacific Coast for Sparklets, Inc., New York City. The Gute company has recently taken over that part of the territory formerly handled for Sparklets, Inc., by the Phil B. Bekeart Company.

To Distribute Clark Electric Water Heaters—The Graybar Electric Company, San Francisco, has been appointed distributor in northern California of Clark electric water heaters, manufactured by the McGraw Electric Company, Omaha, Neb. Substantial reductions in price on all models of Clark water heaters have recently been announced.

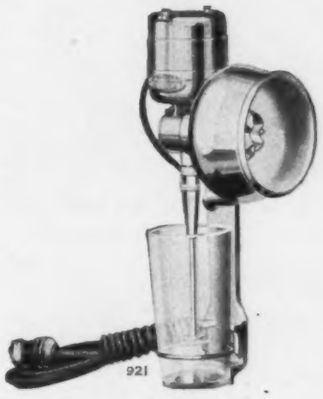
Thor Shop Changes Address—The location of the Thor Shop in Seattle has been changed from 502 Haight Building to 1603 Hoge Building. The Thor Shop handles health motors, washing machines, ironing machines and health lamps manufactured by the Hurley Machine Company, Chicago.

Service Truck for Hotpoint Heavy Duty Equipment

THE Los Angeles factory branch service station of the Edison Electric Appliance Company, Inc., uses this fully equipped truck for field service on all Hotpoint ranges and Edison heavy duty hotel and restaurant equipment. It covers the entire system of the Southern California Edison Company, Bureau of Power and Light of the City of Los Angeles, and the Los Angeles Gas and Electric Corporation. A small power drill and actelylene torch are carried with the truck.

New Equipment

Mixer, Fruit Juice Squeezer and Portable Fan



"Biddy" is a new household servant recently placed on the market by Robbins & Myers, Inc., Springfield, Ohio. The device extracts orange or other fruit juices, mixes malted milk or other drinks, beats eggs, whips cream and mixes mayonnaise and other salad dressings. "Biddy" weighs 6 lb. and is 14 in. in length. It fits in a neat, inconspicuous bracket that is attached permanently to any convenient place on the kitchen or pantry wall. It can be left in the bracket if desired, or it can be lifted out and stored in a cupboard or drawer. Retail price, $14.95.

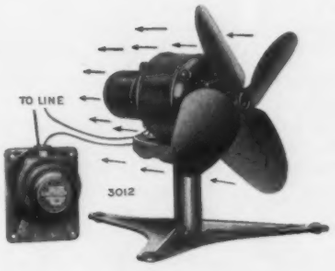
An 8-in. portable wall fan has been developed by Robbins & Myers to fit into the same wall bracket provided for "Biddy." The fan is suspended by springs which insure quiet operation, and a swivel joint permits the fan to be tilted upward and downward or to either side. Retail price of the fan is $8.50; extra wall brackets to install in different rooms, 20 cents each.—ELECTRICAL WEST, Jan. 1, 1930.

Contact Cable

A cable which, when compressed at any point in its entire length, throws a switch, turns on a light or sounds a signal is a recent invention of the Bishop Wire & Cable Corporation, 420 Lexington Ave., New York. The invention consists of a waterproof, dustproof and acid-proof cable about the size of an ordinary lead pencil inclosing two conductors left bare but separated from each other by an isolation cushion of rubber. When the cable is pressed this isolation cushion yields and permits the outer conductor to contact with a wire which is always in contact with the inner conductor, thus closing the circuit. When the pressure is released the isolation cushion returns the outer conductor to its normal position, thus opening the circuit.

The cable is expected to have a number of uses: in the home for electrical devices, lights and radios; in banks and other places of business as a protection against holdups; in mines and other underground operations where, in an emergency, signal buttons may be at remote places; in hospitals; in power plants as life savers and time savers, and in automatic traffic control. —ELECTRICAL WEST, Jan. 1, 1930.

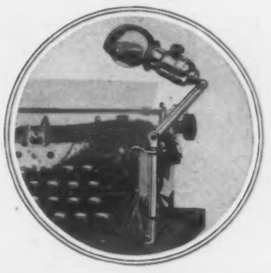
Furnace Fan



A new Emerson furnace fan recently placed on the market by the Emerson Electric Manufacturing Company, St. Louis, Mo., forces the heat directly to the rooms, overcoming sluggish circulation and preventing the heat from escaping out through the furnace casing and warm air ducts before it gets to the rooms. By preventing these heat losses less fuel is consumed, making an appreciable saving in fuel costs. The home is also heated more evenly and comfortably.

The Emerson has a slow-speed motor insuring quietness. The four steel blades are especially designed for quiet operation and to give a maximum velocity to the air. Wool-packed bearings insure proper lubrication and have sufficient lubricant for 2,000 to 3,000 hours or service. The adjustable motor mounting is made for three different positions—horizontal and at angles of 22½ and 45 deg., making it suitable for duct or boot installation.—ELECTRICAL WEST, Jan. 1, 1930.

Portable Typewriter Light



A specially designed lighting fixture for attachment to any make of portable typewriter has been placed in production by the Vimco Manufacturing Company, of Buffalo, N. Y. The new lamp, called "Vimcolight," is easily attached and need not be detached when the typewriter is inclosed in its case. It is equipped with a Mazda S-11 bulb and special reflector that provides a soft, diffused illumination on keyboard, typing and notes. The light is boxed complete with Mazda bulb, 8 ft. of silk, non-kinkable cord, and plug. Intended retail price, $5.—ELECTRICAL WEST, Jan. 1, 1930.

Medicine Cabinet

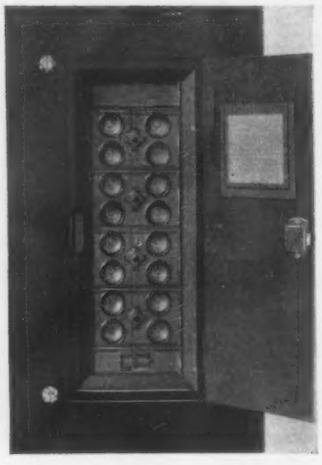
A novel electrically equipped medicine cabinet for bathrooms is being manufactured by the Economy Electrical Manufacturing Company, Kansas City, Mo. The fixture, known as the Electro-Kabinet, is fitted with chromium plated light brackets, convenience outlet for curling iron, fan, heater, or other appliance, and switch for the lights.

The cabinet is built in eight popular models for home, apartment and hotel use, and may be obtained in white duco or a choice of colors in baked enamel finish. The model illustrated has a French plate mirror in the door, and glass shelves furnish space for medicine and toilet articles. The interior of a model built especially for hotel use gives access to water valves.—ELECTRICAL WEST, Jan. 1, 1930.

Narrow Lighting Panelboards

A full line of new narrow lighting panelboards is announced by the Square D Company, Detroit, manufacturer of electrical control equipment. The boards are only 12 in. wide over all and may be used in places where larger panelboards cannot conveniently be installed. For industrial or domestic use they meet the requirements up to 100-amp. capacity and are made complete with all copper bus bars of standard capacity.

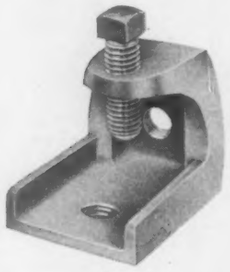
Six different wiring combinations are possible with the new narrow panelboards. They can be supplied with cartridge fuses as well as plug fuses, and switched circuits as well as fuses only can be supplied in the branches.—ELECTRICAL WEST, Jan. 1, 1930.



Cornice Lighting Unit

A new type of floodlight introduced by the General Electric Company, Schenectady, N. Y., is intended for cornice, relief and outdoor home lighting. Suitable for mounting on the top of a cornice to eliminate the shadow created from floodlights mounted below, it has a low mounting height so that it will not be conspicuous along the cornice. The new floodlight, known as Type L-32, has a wide light distribution, effective for short-range floodlighting. The unit consists of an inexpensive hot-dip galvanized cast iron casing equipped with a twin socket for two 50-, 60-, 75- or 100-watt general service lamps. The inner surface of the casing, which is the reflecting medium, is sprayed with several coats of aluminum paint, providing a highly efficient reflecting sruface and giving a wide distribution of light. A trunnion bracket is provided for mounting. By loosening a wing nut at each end of the casing it may be adjusted to any position. The floodlight is provided with a clear glass door, but color plates are available if required.—ELECTRICAL WEST, Jan. 1, 1930.

Insulator Supports



Two new insulator supports, No. 505 and 506, have been added to the line of clamps manufactured by the Steel City Electric Company, 1207 Columbus Ave., Pittsburgh, Pa. These two supports are furnished with a longer mounting surface than that of former models, which enables the user to standardize on one size of support where different fittings requiring different sizes of drilled and tapped holes must be mounted on the same support. These two supports can be tapped with combinations of drilled or drilled and tapped holes, which eliminates the necessity of carrying more than one type of support in stock.—ELECTRICAL WEST, Jan. 1, 1930.

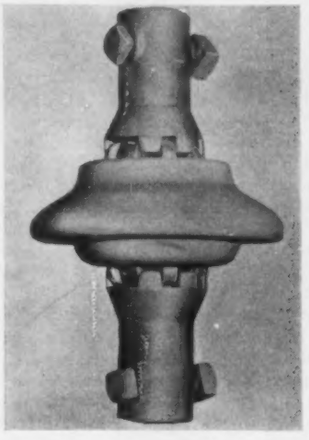
Motor-Driven Pole Changer

In a new motor-driven contact maker for converting direct current to alternating current, developed by the Bodine Electric Company, 2254 West Ohio St., Chicago, direct current is fed to a special commutator through a pair of slip rings, and the output is taken from brushes in contact with the commutator. The motor can be wound for any a.c. or d.c. voltage and has no electrical connection with the slip rings or commutator. For therapeutic work, the commutator is designed to give an alternating current of 360 cycles per second or higher if necessary. The same equipment can be used for selective frequency ringing or for any purpose requiring an alternating current. These units are made in capacities of 100 watts or higher. — ELECTRICAL WEST, Jan. 1, 1930.

Conduit Elbow

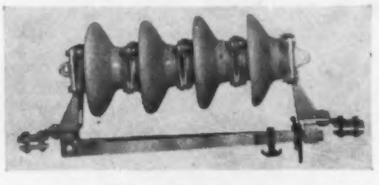
The addition of a new elbow (Catalog No. 2136) to its line of fittings for conduit underplaster extension and surface raceway has been announced by the National Electric Products Corporation, Pittsburgh, Pa. This new fitting takes a conduit into a ½-in. knockout or coupling and combines in one piece a ½-in. conduit box connector, 90-deg. elbow and coupling.—ELECTRICAL WEST, Jan. 1, 1930.

Porcelain Insulator and Disconnecting Switch



For insulating the operating mechanism shafts of gang operated pole top switches, the Champion Switch Company, Kenova, W. Va., has developed the high strength porcelain unit pictured. To the upper and lower surfaces are secured fittings which can be readily attached to the switch operating pipe.

The suspension type, line hook, stick operated disconnecting switch illustrated below is another recent development of the Champion Switch Company. The interchangeable units of this switch are shunted by a reinforced truss blade in turn provided with blade guides, lugs and compression type solderless connectors. The new switch is made for various voltages and a wide range of ampere capacities—ELECTRICAL WEST, Jan. 1, 1930.



Extension Light

The Household Cordlite, a rubber cord extension light made especially for home use, is announced by the Belden Manufacturing Company, 2300 South Western Ave., Chicago.

The new unit includes a soft rubber plug, a rubber socket handle, and 20 ft. of flexible all-rubber cord. The set is waterproof, and prevents shocks. It is made to withstand rigorous usage and all unfavorable conditions in the basement or garage.

Plug, cord and safety socket handle are of brown rubber specially treated for flexibility and long life. Guard with detachable hook is included.—ELECTRICAL WEST, Jan. 1, 1930.

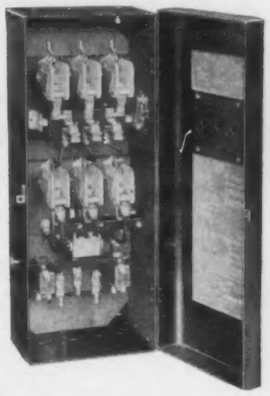
Meter Service Switches

Noark 30-amp. accessible fuse type meter service switches, manufactured by Colt's Patent Fire Arms Manufacturing Company, Hartford, Conn., are now being furnished with a new type of cover. As may be seen from the illustration, it is only necessary to slide the cover of the fuse compartment a very short distance—less than the width of the handle. This feature permits the switches to be ganged up closer together than when it is necessary to slide the cover of the fuse compartment nearly the width of the box.—ELECTRICAL WEST, Jan. 1, 1930.

Motor Starter Equipment

Standard a.c. across-the-line switches manufactured by the Allen-Bradley Company, 286 Greenfield Ave., Milwaukee, Wis., are now furnished equipped with hand operated disconnect switches and meter test jacks in one cabinet.

The disconnect switches are furnished with or without fuse clips. The meter test jacks permit the motor to be tested for load without opening the switch cabinet or interfering with machine operation.—ELECTRICAL WEST, Jan. 1, 1930.



Recent Publications

"MODERN POWER PLANT EQUIPMENT"—This is the title of a 48-page booklet that has been published by The International Nickel Company, Inc., 67 Wall St., New York City, for power users. The booklet contains several features on power plant equipment of the past and present and traces results obtained in many industries through the use of rustless metals.

"ARC WELDING OF PIPE LINES—In a booklet of this title The Lincoln Electric Company, Cleveland, Ohio, has republished an article by J. F. Lincoln, president, that appeared last year in *The Oil and Gas Journal* describing the application of the electric arc welding process to pipe line construction.

G. E. PUBLICATIONS—Recent publications of the General Electric Company, Schenectady, N. Y., include:

GEA-1145: Mechanical-drive Turbines.
GEA-77C: Capacitors for Power-factor Correction.
GEA-607A: Distribution Transformers.

NEON LAMPS—Hot cathode neon lamps for use on alternating current are the subject of Bulletin No. 700 just issued by the Cooper Hewitt Electric Company, Hoboken, N. J.

HIGH TENSION SWITCHES—Rocker type "S" switches with rocking insulator actuated by a square group control shaft, produced by the Pacific Electric Manufacturing Corporation, 5815 Third St., San Francisco, are described in Bulletin No. 29 issued recently by that company.

HEATING UNITS—Chromalox strip heaters, space heaters, as well as complete air heaters are listed in Bulletin C-108A of the Edwin L. Wiegand Company, 7500 Thomas Boulevard, Pittsburgh, Pa., just released. Prices and standard ratings of all heaters are given.

"NINE MEN AND ONE WOMAN"—In a brochure with this title issued by The Standard Electric Stove Company, Toledo, Ohio, are set forth the reports of sales made by nine salesmen and one saleswoman working in seven different states in a recent electric range selling contest.

LIGHTING FIXTURES—Hospital, school, commercial and public building lighting fixtures designed and manufactured by The Edwin F. Guth Company, St. Louis, Mo., are listed and illustrated in the company's latest catalog, No. 24, now being distributed.

COMMUTATOR MAINTENANCE — Catalog B-829 recently issued by the Ideal Commutator Dresser Company, Sycamore, Ill., describes and illustrates the company's ideal motor maintenance equipment and electrical specialties.

D.C. MOTOR CONTROLLER—An automatic magnetic-reversing, dynamic braking printing-press controller for d.c. motors is the subject of Bulletin No. 115 recently issued by the Monitor Controller Company, Baltimore, Md.

ELECTRIC ARC WELDER—Specification sheets have been issued by The Lincoln Electric Company, Cleveland, Ohio, covering six different models of the Lincoln 300-amp. "stable-arc" welder.

ELECTRIC GRINDERS—A new grinder booklet entitled "Precision Features of "Oesterlein Grinders" is being distributed by The Oesterlein Machine Company, Cincinnati, Ohio, describing the company's grinding tools with a solid-backed cutting edge for use in tool rooms.

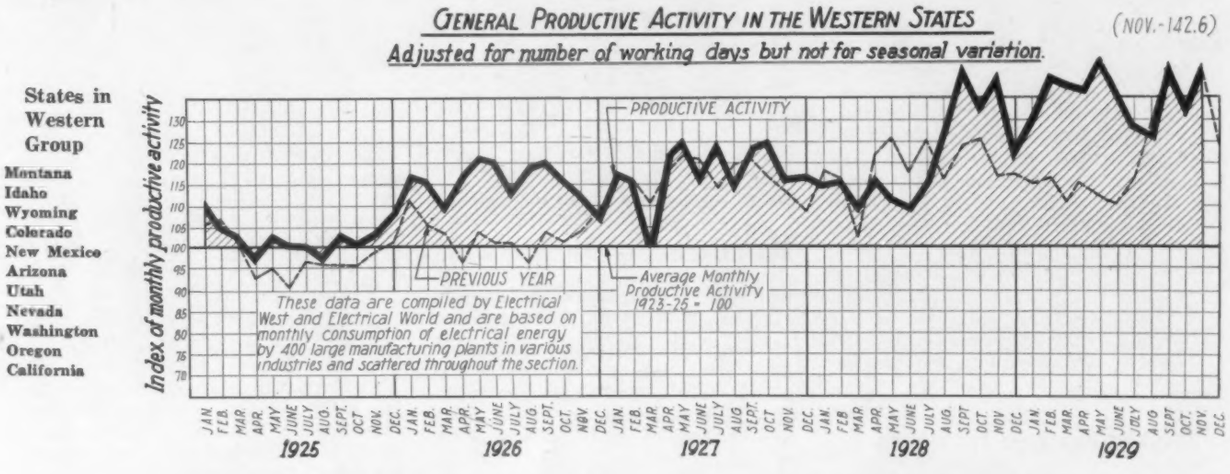
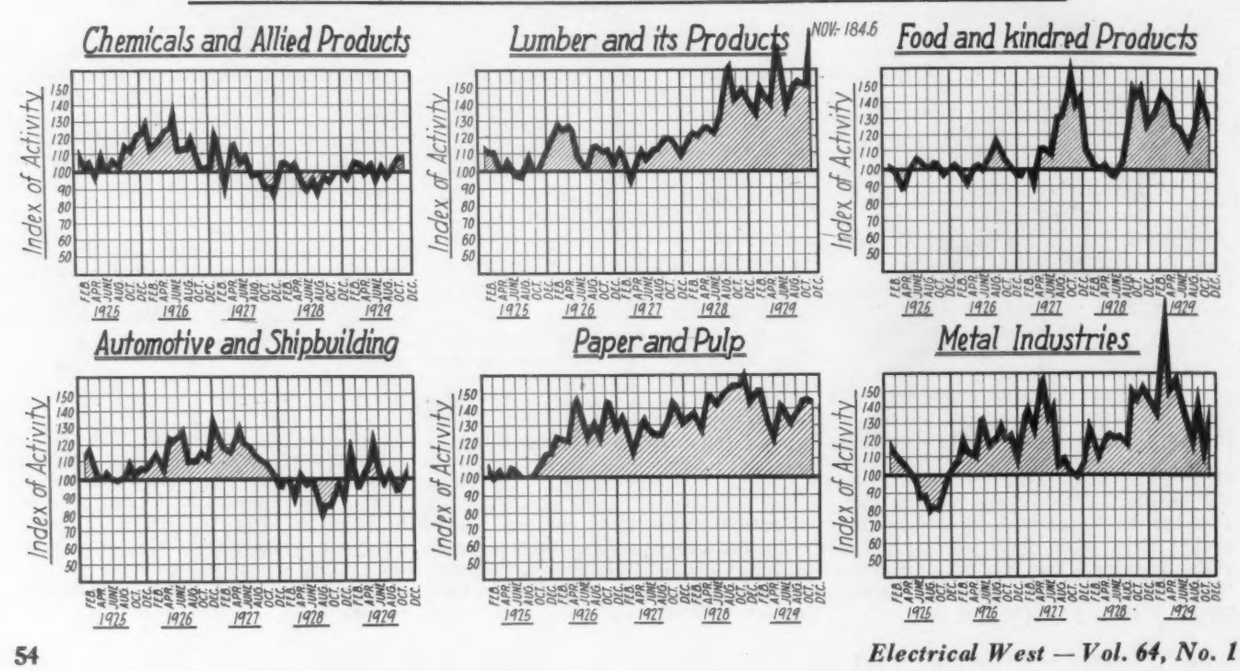
ELECTRICAL WEST Barometer of Industrial Activity in Western States

THAT the manufacturing plants of the Western states as a whole are operating on a slightly higher plane than last year is indicated by reports received on the consumption of electrical energy for power. The November rate of activity, after corrections are made for number of working days, was 6.6 per cent above October, and 1.4 per cent over November last year. Such a favorable situation in Western manufacturing is entirely different from November conditions in the country as a whole for which reports on electrical energy consumption indicate a drop of 8.7 per cent as compared with October, and 7.8 per cent as compared with November last year. The average rate of operations of the Western manufacturing plants during the first eleven months of the year was 11 per cent above the same period in 1928, while in the country as a whole this figure was 8.1 per cent above that of the same period in 1928.

Operations in the lumber industry are largely responsible for the increased rate of general operations during November. Energy consumption figures for these plants indicate that the November rate of activity was 21.3 per cent above October and 22.4 per cent over November last year. Some of the larger lumber manufacturing companies report current November operations as much as from 50 to 90 per cent above November last year, while some report operations under last year, one large company reporting a drop of 16 per cent as compared with November last year.

On the other hand, the food products industry reports a drop in rate of productive activity during November of 7.2 per cent as compared with October, and 13.7 per cent as compared with November last year.

Indexes of Industrial Activity in the Western States

(All figures adjusted for number of working days.)

	Nov. 1929	Oct. 1929	Nov. 1928	Av. 1st 11 mos. 1929	Av. 1st 11 mos. 1928
All industry	142.6	133.8	140.7	136.6	123.1
Chemical and allied products	109.7	109.0	97.3	99.9	96.6
Food and kindred products	131.3	141.5	152.2	135.6	119.7
Metals group	141.7	120.2	156.8	148.7	130.8
Lumber and its products	184.6	152.2	151.0	156.6	136.9
Paper and pulp	144.8	147.2	162.4	142.6	147.8
Rubber and its products	137.0	154.8	164.2	178.8	155.1
Shipbuilding	107.1	92.8	86.2	103.5	89.8
Stone, clay and glass	121.0	138.8	133.6	139.4	141.2